

# **COSEWIC Annual Report**

presented to

**The Minister of the Environment**

and

**The Canadian Endangered  
Species Conservation Council  
(CESCC)**

from

**The Committee on the Status  
of Endangered Wildlife in Canada  
(COSEWIC)**

**2007 - 2008**

**COSEWIC**  
Committee on the Status  
of Endangered Wildlife  
in Canada



**COSEPAC**  
Comité sur la situation  
des espèces en péril  
au Canada

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of Endangered Wildlife  
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des espèces en péril  
au Canada

August 28, 2008

The Honourable John Baird  
Minister of the Environment  
Les Terrasses de la Chaudière  
10 Wellington Street  
28th Floor  
Gatineau, Québec  
K1A 0H3

Dear Minister Baird,

Please find enclosed the 2007-2008 Annual Report of the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) which I respectfully submit to you and to the Canadian Endangered Species Conservation Council (CESCC), thus fulfilling the obligations to COSEWIC under Sections 25 and 26 of the *Species at Risk Act* (SARA). Please be advised that this report is available online at [http://www.sararegistry.gc.ca/sar/assessment/cosewic\\_annual\\_e.cfm](http://www.sararegistry.gc.ca/sar/assessment/cosewic_annual_e.cfm)

This year, 2008, marks the 30<sup>th</sup> year since COSEWIC assessed its first species at risk in Canada.

I would like to draw your attention to the items elaborated on in the attached report for your approval, consideration or information.

Item I - COSEWIC Activities (for information)

To date, COSEWIC has assessed 564 species in various risk categories, including 234 Endangered, 143 Threatened, 152 Special Concern, 22 Extirpated Species and 13 species as Extinct.

Item II - COSEWIC Membership (for information)

In my letters to you of May 31, 2008, I provided the names of individuals who have been nominated for membership on COSEWIC by jurisdictions and by COSEWIC for your approval. You will also find the names of those individuals within this report. In addition, a

nominee for membership has been proposed to you by the Government of Newfoundland & Labrador.

ITEM III- COSEWIC Operations and Procedures (for approval)

I wish to draw attention to the following changes in Operations & Procedures :

Guidelines for Recognizing Designatable Units Below the Species Level (Initial Approval by COSEWIC in November 2007 for April 2008 Species Assessment Meeting; Final Approval by COSEWIC April 2008)

Guidelines on Manipulated Populations (Approved by COSEWIC April 2008)

Guidelines for the Use of Index of Area of Occupancy in COSEWIC Assessments (Approved by COSEWIC April 2008)

It is anticipated that all of these changes will have been implemented by COSEWIC prior to the Autumn 2008 Species Assessment Meeting in November, 2008.

ITEM IV - COSEWIC Communications Plan (for information)

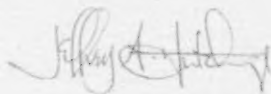
Following a request by the Canadian Wildlife Directors Committee to work on developing an outreach strategy to explain COSEWIC to Canadians, a summary of presentations given by the Chair of COSEWIC is provided.

Item V - Species Status Assignments (for consideration)

A list of species assessed since the last reporting is included, indicating status assigned, reasons for designation (including uncertainties, if applicable), and COSEWIC criteria with alphanumeric codes.

I wish to express my sincere appreciation for the support of your ministry to COSEWIC and to the conservation and protection of species at risk in Canada.

Yours sincerely,



Jeffrey A. Hutchings  
Chair of COSEWIC

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## ITEM I - COSEWIC ACTIVITIES

### 1. Species Assessment Meetings

#### Autumn, 2007

Date: November 28-30, 2007

Location: Ottawa, Ontario

#### **Attendance:**

*Members* - 44 members/alternates

*Secretariat Staff* – 13

*Observers* – 29 (2 - Species Specialist Co-chairs elect, 1 - nominee for membership from Fisheries & Oceans Canada, 3 – Canadian Wildlife Service, 4 - Fisheries & Oceans Canada, 3 - Parks Canada, 1 – Indian & Northern Affairs, 2 – Canadian Wildlife Federation, 2 – World Wildlife Fund Canada, 1 - Ontario Ministry of Natural Resources, 4 – students, McGill University, 4 - members, Freshwater Fishes Specialist Subcommittee, 1 – Government of Northwest Territories, 1 – professor/Canada Research Chair in Arctic System Science, University of Manitoba, who delivered a presentation on “Trends in the Thickness and Distribution of Arctic Sea Ice”)

#### Spring, 2008

Date: April 20-25, 2008

Location: Yellowknife, Northwest Territories

Hosted by the Government of the Northwest Territories

#### **Attendance:**

*Members* - 40 members/alternates

*Secretariat Staff* – 10

*Observers* – 24 observers (4 – Fisheries & Oceans Canada, 3 - Canadian Wildlife Service, 2 Canadian Wildlife Federation, 10 – Government of the Northwest Territories, 1 - Ontario Ministry of Natural Resources, 1 - Aboriginal Traditional Knowledge Subcommittee member, 1 – Gwich'in Renewable Resource Board, 1 – Wek'eezhii Renewable Resources Board, 1 – Wildlife Management Advisory Council, Northwest Territories)

#### **Teleconferences:**

Following each of the above-noted COSEWIC Species Assessment Meetings, the Chair of COSEWIC chaired a teleconference with the Canadian Wildlife Directors Committee (CWDC), followed by a joint teleconference with representatives of the Wildlife Management Boards (WMBs) and members of the National Aboriginal Council on Species at Risk (NACOSAR). Documents detailing the species assessments resulting from the COSEWIC Species Assessment Meetings were provided in advance of these teleconferences.

## 2. Summary of the Species Assessment Meetings

In November 2007, COSEWIC assessed/reassessed the status of 15 wildlife species (species, subspecies and populations) based on 13 Status Reports, none of which were unsolicited reports.

The species assessment results include the following:

Endangered: 5

Threatened: 5

Special Concern: 2

In addition, 3 species were reassessed as Not at Risk.

In April 2008, COSEWIC assessed/reassessed the status of 31 wildlife species (species, subspecies and populations) based on 28 Status Reports, of which six were unsolicited.

The species assessment results include the following:

Extirpated: 3

Endangered: 16

Threatened: 4

Special Concern: 4

In addition, 2 species were assessed as Not at Risk, 2 were examined and found to be Data Deficient, and one designation was de-activated (see point 3 under Important Notes Regarding Status Assessment).

As of April 2008, the COSEWIC assessment results include 564 species in various categories, including 234 Endangered species, 143 Threatened species, 152 species of Special Concern, 22 Extirpated species (no longer found in the wild in Canada but occurring elsewhere) and 13 Extinct species.

**See Appendix I** for the COSEWIC Press Releases from the November 2007 and April 2008 Species Assessment Meetings.

At the November 2007 Species Assessment Meeting, a new COSEWIC logo was launched and approved as the new official logo of the committee. The logo was designed by West Hawk Associates (David Wylynko) with consultation / direction by Nancy Davy (COSEWIC Secretariat). The new logo appears within this report.

### 3. Important Notes Regarding Status Assessments:

Orangespotted Sunfish (*Lepomis humilis*): This species' designation was de-activated in April 2008 because it was concluded that this species is ineligible for assessment. This species had been previously assessed by COSEWIC as Special Concern in April 1989 and is on Schedule 3 of SARA.

**Following the recommendation of the Freshwater Fishes Specialist Subcommittee, COSEWIC requests that the status assessment of the Orangespotted Sunfish be withdrawn from further action under SARA.**

#### Emergency Assessments:

During the period covered in this report (August 31, 2007 - August 28, 2008), COSEWIC did not receive any requests for Emergency Assessment.

### 4. Regarding Species Assessments returned by the Governor in Council (GIC) to COSEWIC for further information or consideration:

There have been no species assessments returned by GIC to COSEWIC since the submission of the COSEWIC's Annual Report in August 2007.

Regarding the species assessments returned to COSEWIC in 2006 for further consideration, COSEWIC awaits decisions regarding the acceptance or rejection of its advice on Bocaccio, Atlantic Cod (Arctic Population), Cusk, Lake Winnipeg Physa, and Verna's Flower Moth, most of which were assessed by COSEWIC in 2002 and 2003.

### 5. Species Selected for Status Report Preparation to be included in the Autumn 2008 Call for Bids

COSEWIC's process for determining those species for which status reports will be commissioned was described in the 2005 Report to CESSC. This procedure was followed again in 2007-2008. At the April 2008 COSEWIC meeting, the following 15 species from COSEWIC's prioritized candidate list were chosen for status report commissioning in the Autumn of 2008, in addition to 49 species requiring update status reports.

Species Name	Species Specialist Subcommittee
1. Bluefin Tuna (Western North Atlantic population)	Marine Fishes
2. Georgia Basin Bog Spider	Arthropods
3. Sockeye Salmon	Marine Fishes
4. Chinook Salmon	Marine Fishes
5. Carcross Dune Tachinid	Arthropods
6. Hine's Emerald	Arthropods
7. Barn Swallow	Birds

Species Name	Species Specialist Subcommittee
8. Canadian Philaonia	Arthropods
9. <i>Daltonia splachnoides</i>	Mosses
10. Olive Clubtail	Arthropods
11. Eastern Meadowlark	Birds
12. Hop-tree Borer	Arthropods
13. Peacock Vinyl	Lichens
14. Batwing Vinyl	Lichens
15. Cutlip Minnow	Freshwater Fishes

## 6. Workshops

### Aboriginal Elder/Knowledge Holders Workshops

An Elders Workshop to review Aboriginal Traditional Knowledge (ATK) process and protocol guidelines was held in March 2008 following postponement of earlier workshops planned for 2007. Participating Elders and Knowledge Holders from Métis, Inuit and First Nations communities travelled from Ontario, Manitoba, Saskatchewan, Alberta, British Columbia, Yukon and the Northwest Territories to provide advice and recommendations on gathering and including ATK in the COSEWIC species assessment process. ATK Subcommittee (SC) members facilitated the workshop breakout sessions.

Outcomes identified in the March 2008 Elders Workshop have been combined with recommendations and advice contained in a February 2008 Elders Workshop report that was coordinated by the Chiefs of Ontario.

Future workshops are planned for Nunavut and the Maritimes (to include Quebec Elders). Advice, guidance and recommendations from the four workshops will be synthesized to produce a final version of the protocol that will be used by the ATK SC for the collection and interpretation of ATK in species status assessments. The protocol will be reviewed for context and accuracy by participating Elders and Knowledge Holders prior to implementation in the COSEWIC species assessment process.

### Workshop – Guidelines for the Inclusion and Exclusion of Manipulated Populations in Species Status Assessments

The COSEWIC-hosted workshop was held in Ottawa on March 10 and was attended by six COSEWIC members, including the members from Environment Canada and Fisheries & Oceans Canada (DFO), five participants from Environment Canada, four from DFO, three from Parks Canada and one Secretariat staff.

Presentations were made by three COSEWIC members and by representatives of Environment Canada, DFO & Parks Canada.

Following the formation of small break-out groups, several recommendations were received; these were considered and discussed by COSEWIC at the April Species Assessment Meeting.



## **7. Annual Subcommittee Meetings:**

### Aboriginal Traditional Knowledge Subcommittee

It was agreed by the ATK SC that Norma Kassi (Native Women's Association of Canada) will serve as an ATK advisor to the SC.

One of the members of the ATK SC, Gabriel Nirlungayuk, provided guidance and advice on the translation of the update interim status report on the Polar Bear into Inuktitut. The finalized update status report on the Polar Bear will be the first COSEWIC status report to be posted on the SARA Registry in Inuktitut.

Terms of Reference are being prepared for an ATK review of the caribou in Canada. Phase I will summarize and map (using GIS analysis) existing information from Aboriginal and other sources and include a gap analysis for follow-up with Knowledge Holders in Phase II. The call for bids is anticipated to be posted through MERX in 2008.

The ATK SC is currently considering developing an ATK species priority list which will be shared with COSEWIC once it becomes available.

One of the members of the ATK SC, Dr. Donna Hurlburt, will be updating the ATK SC portions of the COSEWIC Operations & Procedures Manual for review and approval by COSEWIC.

An ATK bibliographic library with a searchable keyword database has been generated by the Secretariat, using Endnote software. It is for use by all interested parties. The library will be updated regularly and maintained by the Secretariat. Many articles are currently only available in paper form and the intent is to digitize all articles as soon as it is feasible to do so.

### **Species Specialist Subcommittees:**

Species Specialist Subcommittee (SSC) meetings take place annually in different locations in Canada or by teleconference. During the face-to-face meetings, observers are invited to attend and sometimes a public information session takes place. Important topics of discussion during these meetings include the reporting of results of recent COSEWIC Species Assessment Meetings, results of public calls for bids for the preparation of COSEWIC status reports, and results of public calls for membership. Additionally, subcommittees provide orientation to their new members, develop recommendations on species status assessment, review candidate lists of species proposed for assessment, discuss special projects and plans, and receive an update on COSEWIC Operations and Procedures.

Indicated below are the names of the COSEWIC SSCs and, where relevant, a summary of special activities, projects and plans undertaken by the SSC.

COSEWIC is extremely grateful for the important work of the SSC members who provide their time and expertise on a volunteer basis.



#### Amphibians & Reptiles Specialist Subcommittee

No special projects to report.

#### Arthropods Specialist Subcommittee

With the introduction of Coccinelid Beetles from other countries over the past 30 years, there has been a sharp decline in native species in various parts of Canada. Over large areas, such as southern Ontario, native species have apparently disappeared completely. There is compelling evidence for the very substantial decline of at least a dozen species and many may be nearing extinction. As a consequence of these concerns, the Arthropods SC has initiated a project to document declines, identify threats and rank species of Coccinelid Beetles according to the degree of threat in each province and territory. This report could provide a basis for national general status ranking, assist jurisdictions and also provide COSEWIC with the information necessary to determine appropriate next steps.

#### Birds Specialist Subcommittee

Michel Gosselin of the Canadian Museum of Nature completed a contract to create a matrix of Canadian birds and conservation data (e.g., trends, status, taxonomy). This matrix will serve as an invaluable database that can be consulted by SSC members and status report authors.

#### Freshwater Fishes Specialist Subcommittee

The SSC received a draft of the Freshwater Fishes study on the *Clupeaformis* complex and a final draft report will be provided to COSEWIC by April, 2009. The SSC provided considerable input in the revision of COSEWIC's Guidelines for Recognizing Designatable Units below the Species Level.

#### Lichens and Mosses Specialist Subcommittee

The newly formed Subcommittee has initiated a project to develop a candidate species list of lichens in Canada.

#### Marine Fishes Specialist Subcommittee

The SSC provided considerable input in the revision of COSEWIC's Guidelines for Recognizing Designatable Units below the Species Level.

The SSC continues to work on finalizing the ecozones map for the Atlantic.

While acknowledging that the assessment of fisheries management plans is not COSEWIC's responsibility, the SSC is working to develop a brief summary checklist of indices that could be used to evaluate the likelihood that a fisheries management plan would serve as an effective means of determining whether a decline of an exploited marine fish population had ceased or not.

To complement the Instructions to Status Report Writers, draft guidelines addressing issues of particular relevance to assessments of marine fishes were developed. The Marine Fishes SC has also been active in the development of guidelines that could be used in conjunction with the application of the decline criterion (Criterion A).

#### Marine Mammals Specialist Subcommittee

No special projects to report.

#### Molluscs Specialist Subcommittee

The Molluscs SC was hindered in its attempt to develop a comprehensive prioritized candidate list of terrestrial molluscs by the general lack of knowledge or outdated knowledge of these species for most areas of Canada. The terrestrial mollusc fauna of southern Ontario and Quebec, largely corresponding to the COSEWIC Great Lakes / St. Lawrence and Carolinian faunal provinces, particularly stands out as requiring COSEWIC's attention. This fauna includes many species, including possible endemics and certainly globally rare species, with specialized and in some cases rare habitats, small areas of occurrence, and possibly significant threats. A Call for Bids to undertake a special project to develop a prioritized candidate species list of terrestrial molluscs of Ontario and Quebec was posted during the February 15 – March 14, 2008 Call for Bids and a contract was awarded.

#### Terrestrial Mammals Specialist Subcommittee

No special projects to report.

#### Vascular Plants Specialist Subcommittee

No special projects to report.

### **8. Update on Progress of Working Groups within COSEWIC**

Name of working group	Summary of progress
1. Ecosystem Approach	The Chair charged the Ecosystem Approach Working Group with identifying an appropriate ecosystem classification scheme that COSEWIC could use when assigning the ecosystem to which assessed species belong. He asked the Ecosystem Working Group to assess the additional financial, logistic, data and communication requirements demanded of the construction of a species-at-risk database that would include ecosystem and threat information.
2. Threats Classification	New working group struck to examine how the identification and reporting of threats can be improved and better standardized.

Name of working group	Summary of progress
3. Sand Dunes Ecosystem	Work by Dr. Darren Bender's lab, University of Calgary, is ongoing. Work has fueled additional field surveys for arthropods and host plants.
4. Designatable Units	Guidelines for Recognizing Designatable Units below the Species Level have been approved by COSEWIC. A key that may assist report writers in the identification of Designatable Units will be made available. Working Group has been dissolved.
5. Manipulated Populations and Captive Breeding	Guidelines approved following workshop held March, 2008. Working Group has been dissolved.
6. Instructions to Status Report Writers	Draft Report presented. Final report in preparation with approval anticipated in November 2008
7. Evaluation Grid for Member Selection	Revised Evaluation Grids for selection of members of COSEWIC and Species Specialist Subcommittees tested during recent calls for membership and recommended for future use by selection committees. Working Group has been dissolved.
8. Criteria	Guidelines approved for use of Index of Area of Occupancy.
9. SARA Parliamentary Review	Report presented by the Working Group was anticipatory in that it identified areas that may be contentious during the forthcoming parliamentary review of SARA. The report also emphasized the need to defend and retain those sections of SARA that pertain to the independence of COSEWIC, the necessity of having members of COSEWIC act independently of organizational or jurisdictional affiliation, the function of COSEWIC to prioritize species for status assessment, and the ability to assess status below the biological species level.
10. Long-term Strategic Planning	A Procedure for Status Reviews (including Status Appraisals and Re-assessments) has been developed by the Working Group. A draft procedure has been presented that deals with improving COSEWIC's ability to fulfil its legislative requirement to review its classifications every 10 years. In conjunction with this new procedure, each SSC was asked to identify the number of update species status reports that might benefit from the proposed revision and to estimate the potential financial savings that may be realised.
11. Press Release	A Press Release Working Group has been established and tasked with coordinating and preparing the Press Releases issued by COSEWIC at each of its species assessment meetings.

## 9. Renewal – Chair of COSEWIC

Following procedures set out in the Operations & Procedures Manual, a nominating committee was struck, chaired by Dr. Robert Campbell. Dr. Jeffrey Hutchings' name was submitted for renewal as chair of COSEWIC. There were no other nominees and the incumbent, Dr. Hutchings, was acclaimed as chair of COSEWIC for a further two-year term effective April 25, 2008.

## ITEM II - COSEWIC MEMBERSHIP

### Membership Changes:

See Appendix II for a list of current and proposed members.

#### a) Members from Jurisdictions (Provincial/Territorial/Federal)

- The Government of the Yukon Territory has nominated Mr. Bruce Bennett for appointment.
- DFO has nominated Mr. Patrice Simon for appointment.
- The Government of Newfoundland and Labrador has nominated Mr. Paul Glavine for appointment.

These memberships are effective until December 31, 2011.

#### b) Co-chairs of Species Specialist Subcommittees / Non-government Science Member

New /Renewed members were selected as a result of a process that was initiated with the January 2008 public call for members.

Biosketches are herein provided for the following nominees submitted on 31 May 2008 to the Minister of Environment for consideration and subsequent appointment effective from January 1, 2009 to December 31, 2012:

- Co-chair, Amphibians & Reptiles Specialist Subcommittee – Dr. David M. Green
- Co-chair, Arthropods Specialist Subcommittee – Dr. Paul Catling
- Co-chair, Marine Mammals Specialist Subcommittee – Dr. Randall Reeves
- Co-chair, Molluscs Specialist Subcommittee – Dr. Dwayne Lepitzki
- Co-chair, Terrestrial Mammals Specialist Subcommittee – Dr. Justina Ray
- Non-government science member – Dr. Jeffrey Hutchings

See Appendix III for biosketches of these new/renewed COSEWIC members.



### ITEM III - COSEWIC OPERATIONS AND PROCEDURES

The COSEWIC Operations and Procedures Manual has been updated since COSEWIC's previous report to reflect changes in COSEWIC's procedures.

Guidelines for Recognizing Designatable Units Below the Species Level (Initial approval by COSEWIC in November 2007 for April 2008 Species Assessment Meeting; Final Approval by COSEWIC April 2008).

#### See Appendix IV

Guidelines on Manipulated Populations (Approved by COSEWIC April 2008).

#### See Appendix V

Guidelines for the Use of Index of Area of Occupancy in COSEWIC Assessments (Approved by COSEWIC April 2008).

#### See Appendix VI

It is anticipated that all of these changes will have been implemented by COSEWIC prior to the Autumn 2008 Species Assessment Meeting in November, 2008.

### ITEM IV - COSEWIC COMMUNICATION PLAN

The November 2006 letter from the Canadian Wildlife Directors Committee (CWDC) encouraged COSEWIC to work to develop an outreach strategy to explain COSEWIC to Canadians. Subsequently, the Chair of COSEWIC has delivered a number of talks about various elements of COSEWIC to a wide range of audiences. A summary of the talks presented since the 2006 - 2007 Annual Report is provided below.

- May 2007: Orillia Naturalists Club (Orillia, ON)
- May 2007: SARCEP (Species at Risk Coordination Espèces en Péril), Fisheries and Oceans Canada (Dartmouth, NS)
- June 2007: Ikanawtiket (Aboriginal Peoples Species at Risk Initiative, Maritime Aboriginal Peoples Council) (Sackville, NB)
- October 2007: Dalhousie University (Halifax, NS)
- January 2008: 61st Annual Canadian Conference For Fisheries Research (Halifax, NS)
- January 2008: Public talk to an audience that included representatives from commercial fishermen organizations, government and NGOs (Nanaimo, BC)
- February 2008: Evening public lecture at University of Windsor (Windsor, ON)
- February 2008: East Coast Aquarium Society (Dartmouth, NS)
- March 2008: Aboriginal Traditional Knowledge Elders Workshop (Edmonton, AB)



April 2008: IUCN Red List Working Group, Zoological Society of London (London, UK)  
August 2008: 138th Annual Meeting, American Fisheries Society (Ottawa, ON)

## ITEM V– SPECIES STATUS ASSIGNMENTS

List of Species assessed since the last reporting indicating status assigned, reasons for designation (including uncertainties if applicable) and COSEWIC criteria with alphanumeric codes is provided.

**See Appendix VII.**

The status reports are available in English and French on the Public Registry at the following address: [www.sararegistry.gc.ca](http://www.sararegistry.gc.ca)

## APPENDIX I

**COSEWIC**  
Committee on the Status  
of Endangered Wildlife  
in Canada



**COSEPAC**  
Comité sur la situation  
des espèces en péril  
au Canada

### **Once common, now disappearing: Wood Turtle and Olive-sided Flycatcher focus attention on Species at Risk**

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) met in Ottawa, Ontario, November 28-30, 2007 where the conservation status of 15 species was assessed. This is the 30<sup>th</sup> year of work by the Committee.

Canada's only freshwater seal, the Lac des Loups Marins subspecies of the Harbour seal, now estimated to number only about a hundred individuals, is considered Endangered.

#### **Stomping Turtle in trouble**

Wood Turtles can live for several decades along forested creeks and rivers from the Maritimes west to Ontario. This species was assessed as Threatened due partly to the loss of habitat and increased road mortality. These turtles stomp their feet to attract earthworms. A victim of its attractive appearance and tameness, turtles are the focus of illegal harvesting.

Collectors also represent a threat to another reptile, the Eastern Hog-nosed snake, contributing to an assessment of Threatened. Individuals wander widely and are commonly killed on roads. This non-venomous species has a tendency to inflate its neck to a cobra-like hood, hiss, strike, and eventually feign death. These snakes are fast disappearing from southern Ontario.

#### **More unexplained bird declines**

The Olive-sided Flycatcher, a species found across Canada, was assessed as Threatened because of a long-term decline in numbers. Similar to some other recently assessed birds that feed on flying insects and winter in South America, the cause of the decline is unclear.

#### **Fisheries management pays dividends**

The Canary Rockfish is harvested along the West Coast of North America. The species declined drastically as a result of fishing pressure. The overall decline led COSEWIC to assess the species as Threatened. However, improvements in the way the

fishery is managed, including observer coverage and the novel use of video records, have reduced the risk that the species will become endangered.

### **Botanical bottlenecks**

Three perennial plants were all assessed as Endangered. The Wood-poppy is restricted to 3 small and highly fragmented populations in SW Ontario. The Golden Paintbrush and the Yellow Montane Violet both occur in a few scattered locations on southern Vancouver Island and adjacent islands. These plants are all impacted by habitat loss and the spread of invasive aliens.

### **Disappearing sand dune ecosystems**

The Committee assessed the status of two prairie sand dune moths, the Dusky Dune Moth and Pale Yellow Dune Moth. The dusky species, which is associated with disappearing active dunes was assessed as Endangered, while the status of Special Concern was assigned to the pale yellow species which lives in sparsely vegetated semi-stabilized dunes. These moths join a variety of other dune-inhabiting plants and animals at risk of extinction. A working group is partnering with researchers to prepare a report about on-going changes to prairie dune ecosystems.

### **About COSEWIC**

COSEWIC assesses the national status of wild species, subspecies, varieties, or other important units of biological diversity, that are considered to be at risk in Canada. To do so, COSEWIC uses scientific, Aboriginal traditional and local or community knowledge provided by many experts from governments, academia, other organizations and individuals. Assessment summaries are currently available to the public on the COSEWIC website ([www.cosewic.gc.ca](http://www.cosewic.gc.ca)) and will be submitted to the Federal Minister of the Environment in August 2008 for listing consideration under the *Species at Risk Act* (SARA). At that time, the full status reports will be publicly available on the Species at Risk Public Registry ([www.sararegistry.gc.ca](http://www.sararegistry.gc.ca)).

There are now 556 species in various COSEWIC risk categories, including 225 Endangered, 141 Threatened, 155 Special Concern, and 22 Extirpated Species (i.e. no longer found in the wild in Canada). In addition, 13 are Extinct and 43 are Data Deficient.

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal entities (Canadian Wildlife Service, Parks Canada Agency, Fisheries and Oceans Canada, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government science members, and the co-chairs of the species specialist and the Aboriginal traditional knowledge subcommittees.

**Definition of COSEWIC terms and risk categories:**

<b>Wildlife Species:</b>	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
<b>Extinct (X):</b>	A wildlife species that no longer exists
<b>Extirpated (XT):</b>	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere
<b>Endangered (E):</b>	A wildlife species facing imminent extirpation or extinction
<b>Threatened (T):</b>	A wildlife species likely to become Endangered if limiting factors are not reversed
<b>Special Concern (SC):</b>	A wildlife species that may become a Threatened or an Endangered species because of a combination of biological characteristics and identified threats
<b>Not at Risk (NAR):</b>	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances
<b>Data Deficient (DD):</b>	A category that applies when the available information is insufficient (a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction



For further information, contact:

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Halifax NS B3H 4J1

Telephone (1): (902) 494-2687  
Telephone (2): (902) 494-3515  
[Jeff.hutchings@dal.ca](mailto:Jeff.hutchings@dal.ca)

For inquiries on Reptiles and Amphibians

**Dr. Ronald J. Brooks**  
Department of Zoology  
College of Biological Science  
AXELROD Building  
University of Guelph  
Guelph ON N1G 2W1

Telephone: (519) 824-4120 ext. 53944  
Fax: (519) 767-1656  
[rjbooks@uoguelph.ca](mailto:rjbooks@uoguelph.ca)

For inquiries on Birds:

**Dr. Marty Leonard**  
Department of Biology  
Dalhousie University  
1355 Oxford Street  
Halifax NS B3H 4J1

Telephone: (902) 494-2158  
Fax: (902) 494-3736  
[mleonard@dal.ca](mailto:mleonard@dal.ca)

General inquiries:

**COSEWIC Secretariat**  
(819) 953-3215

[www.cosewic.gc.ca](http://www.cosewic.gc.ca)

For inquiries on Marine Mammals:

**Dr. Andrew Trites**  
Director, Marine Mammal Research Unit  
University of British Columbia  
Room 247, AERL, 2202 Main Mall  
Vancouver BC V6T 1Z4

Cell : (604) 209-8182  
Fax: (604) 822-8180  
[trites@zoology.ubc.ca](mailto:trites@zoology.ubc.ca)

For inquiries on Moths:

**Dr. Laurence Packer**  
Department of Biology  
York University  
4700 Keele Street  
Ontario ON M3J 1P3

Telephone: (416) 736-2100 ext. 66524  
[laurencepacker@yahoo.com](mailto:laurencepacker@yahoo.com)

For inquiries on Sand Dunes:

**Dr. Gordon Court**  
Provincial Wildlife Status Biologist  
Resource Data and Species at Risk  
Fish and Wildlife Division, SRD  
Dept. of Sustainable Resource Development  
Government of Alberta  
Main Floor, South Petroleum Plaza  
9915 – 108 Street  
Edmonton AB T5K 2M4

Telephone: (780) 422-9536  
Fax: (780) 422-0266  
[gord.court@gov.ab.ca](mailto:gord.court@gov.ab.ca)

For inquiries on Trees and Plants

**Dr. Erich Haber**  
60 Baywood Dr.  
Stittsville ON K2S 2H5

Telephone: (613) 435-0216  
Fax: (613) 435-0217  
[erich.haber@rogers.com](mailto:erich.haber@rogers.com)

For inquiries on Marine Fishes:

**Dr. Howard Powles**  
53, rue Lortie  
Gatineau QC J9H 4G6

Telephone: (819) 684-7730  
Fax: (819) 684-7730  
[powlesh@sympatico.ca](mailto:powlesh@sympatico.ca)

For inquiries on Aboriginal Traditional Knowledge:

**Henry Lickers**  
Mohawk Council of Akwesasne  
Department of the Environment  
P.O. Box 579  
Cornwall ON K6H 5T3

Telephone: (613) 936-1548  
Fax: (613) 938-6760  
[hlickers@akwesasne.ca](mailto:hlickers@akwesasne.ca)

Further details on all species assessed, and the reasons for designations, can be found on the COSEWIC website at [www.cosewic.gc.ca](http://www.cosewic.gc.ca)

**COSEWIC**  
Committee on the Status  
of Endangered Wildlife  
in Canada



**COSEPAC**  
Comité sur la situation  
des espèces en péril  
au Canada

### **Polar Bear and other Species at Risk Assessed by Independent Canadian Science Body**

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) met in Yellowknife, Northwest Territories from April 20 to 25, 2008.

#### **Polar Bear Future Uncertain**

COSEWIC reassessed the Polar Bear as a species of Special Concern. "The Polar Bear was one of the most challenging species ever assessed by COSEWIC" said Dr. Jeff Hutchings, Chair. Extensive inventory, research, a wealth of Aboriginal traditional and community knowledge and the emerging threats posed by climate change and northern development were considered. In some areas, the bear appears to be increasing; in others it is declining. The reduction of sea ice, a consequence of increasing temperatures, is a threat to the species, especially in the southern part of its range. Future stresses on the population mean that harvest will have to be managed particularly carefully in coming years.

#### **Shrinking habitat: a leading cause of species decline**

The Western Chorus Frog, a harbinger of spring, was previously assessed as Not at Risk across its range. It is now considered as Threatened in Quebec and southeastern Ontario. This quarter-sized frog has suffered rapid declines due to increasing development and the loss of wetlands.

Similarly, the Eastern Foxsnake, about the length of an average person, is Endangered due to loss of wetlands and habitat fragmentation.

Canada's largest hawk, the Ferruginous Hawk, was assessed as Threatened due to fragmentation and degradation of native prairie grasslands.

There are fewer than 20 Spotted Owls remaining in Canada. Their decline is due largely to the loss of old-growth forests.

### **Number of Endangered species grows; some still Endangered after 30 years**

One of the first species assessed by COSEWIC was the endemic Vancouver Island Marmot. Thirty years later, its population has further declined and remains at critically low levels.

COSEWIC assessed a dragonfly for the first time. The Endangered Rapids Clubtail, which requires clean, fast-flowing streams, is restricted to two locations in southern Ontario both of which are subject to increasing pressures of urban development.

Formerly numbering in the millions, the Fawnsfoot, an attractive freshwater mussel, is now facing extinction in southern Ontario. The Fawnsfoot has declined drastically in number due to invasive alien species.

### **Increasing winter storms threaten species on both coasts**

Many climate change models predict an increase in the intensity and frequency of winter storms. The Beach Pinweed, a plant known from coastal dunes in New Brunswick and Prince Edward Island, is at risk from high storm surges. The Seaside Bone, a lichen which grows on pines, occurs only on the southern tip of Vancouver Island in British Columbia. It is Threatened by the loss of host trees during winter storms.

### **About COSEWIC**

COSEWIC assesses the status of wild species, subspecies, varieties, or other important units of biological diversity, considered to be at risk in Canada. To do so, COSEWIC uses scientific, Aboriginal traditional and local or community knowledge provided by experts from governments, academia and other organizations. Summaries of assessments are currently available to the public on the COSEWIC website ([www.cosewic.gc.ca](http://www.cosewic.gc.ca)) and will be submitted to the Federal Minister of the Environment in August 2008 for listing consideration under the Species at Risk Act (SARA). At that time, the full status reports will be publicly available on the Species at Risk Public Registry ([www.sararegistry.gc.ca](http://www.sararegistry.gc.ca)).

There are now 565 species in various COSEWIC risk categories, including 235 Endangered, 143 Threatened, 152 Special Concern, and 22 Extirpated Species (i.e. no longer found in the wild in Canada). In addition, 13 are Extinct and 45 are Data Deficient.

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal entities (Canadian Wildlife Service, Parks Canada Agency, Fisheries and Oceans Canada, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government science members, and the co-chairs of the species specialist and the Aboriginal traditional knowledge subcommittees.

**Definition of COSEWIC terms and risk categories:**

- Wildlife Species:** A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
- Extinct (X):** A wildlife species that no longer exists
- Extirpated (XT):** A wildlife species no longer existing in the wild in Canada, but occurring elsewhere
- Endangered (E):** A wildlife species facing imminent extirpation or extinction
- Threatened (T):** A wildlife species likely to become Endangered if limiting factors are not reversed
- Special Concern (SC):** A wildlife species that may become a Threatened or an Endangered species because of a combination of biological characteristics and identified threats
- Not at Risk (NAR):** A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances
- Data Deficient (DD):** A category that applies when the available information is insufficient (a) to resolve a wildlife species' eligibility for assessment or (b) to permit an assessment of the wildlife species' risk of extinction.



For Further information:

**Dr. Jeff Hutchings**  
Chair, COSEWIC  
Department of Biology  
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Telephone (1): (902) 494-2687  
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[Jeff.Hutchings@Dal.ca](mailto:Jeff.Hutchings@Dal.ca)

For inquiries on birds:

**Richard Cannings**  
1330 East Debeck Road  
R.R. 1, Site 11 – Comp. 96  
Naramata BC V0H 1N0

Telephone: (250) 496-4049  
Fax: (250) 496-4049  
[dickcannings@shaw.ca](mailto:dickcannings@shaw.ca)

For information on arthropods  
(insects and related taxa):

**Dr. Paul Catling**  
Research Scientist and Curator  
Saunders Bldg., Central Expt. Farm  
Ottawa ON K1A 0C6

Telephone: (613) 759 1373  
Fax: (613) 759 1599  
[catlingp@agr.gc.ca](mailto:catlingp@agr.gc.ca)

For information on frogs

**Dr. David Green**  
Redpath Museum  
McGill University  
859 Sherbrooke Street West  
Montréal QC H3A 2K6

Telephone: (514) 398-4086 ext. 4088  
Fax: (514) 398-3185  
[david.m.green@mcgill.ca](mailto:david.m.green@mcgill.ca)

For general inquiries:

COSEWIC Secretariat, (819) 953-3215, [www.cosewic.gc.ca](http://www.cosewic.gc.ca)

Further details on all species assessed, and the reasons for designations, can be found on the COSEWIC website at: [www.cosewic.gc.ca](http://www.cosewic.gc.ca)

For information on lichens

**Dr. René Belland**  
Devonian Botanic Garden  
University of Alberta  
Edmonton AB T6G 2E1  
Telephone: (780) 987-3054  
Fax: (780) 987-4141  
[rbelland@ualberta.ca](mailto:rbelland@ualberta.ca)

For inquiries on mammals:

**Dr. Marco Festa-Bianchet**  
Département de biologie  
Université de Sherbrooke  
Sherbrooke QC J1K 2R1

Telephone: (819) 821-8000 ext. 62061  
Cell (613) 614-4153 (until April 27<sup>th</sup>)  
Fax: (819) 821-8049  
[Marco.Festa-Bianchet@USherbrooke.ca](mailto:Marco.Festa-Bianchet@USherbrooke.ca)

For inquiries on plants

**Dr. Erich Haber**  
60 Baywood Dr.  
Stittsville ON K2S 2H5

Telephone: (613) 435-0216  
Fax: (613) 435-0217  
[erich.haber@rogers.com](mailto:erich.haber@rogers.com)

For information on snakes:

**Dr. Ronald Brooks**  
Department of Zoology  
College of Biological Science  
AXELROD Building  
University of Guelph  
Guelph ON N1G 2W1

Telephone: (519) 824-4120 ext. 53944  
Fax: (519) 767-1656  
[rjbrooks@uoguelph.ca](mailto:rjbrooks@uoguelph.ca)

## APPENDIX II

## COSEWIC Membership

**Table 1. Members from Provinces, Territories and Federal Agencies**

Names of new members provided to COSEWIC and recommended for ministerial nomination are indicated in bold and underlined where applicable.

AS REQUESTED IN A LETTER TO THE MINISTER OF THE ENVIRONMENT DATED MAY 31, 2008 FROM THE CHAIR OF COSEWIC TWO NOMINEES FOR APPOINTMENT AS MEMBERS FROM JURISDICTIONS ARE INDICATED IN BOLD AND UNDERLINED IN THE LIST BELOW.

ALSO, ON JULY 25, 2008, A LETTER OF NOMINATION WAS SENT FROM THE MINISTER OF FISHERIES & AQUACULTURE, GOVERNMENT OF NEWFOUNDLAND & LABRADOR. THE NAME OF THE NOMINEE IS INDICATED IN BOLD AND UNDERLINED IN THE LIST BELOW.

THESE JURISDICTIONAL APPOINTMENTS WILL BE EFFECTIVE UNTIL DECEMBER 31, 2011.

Jurisdiction	Member	Member
<b>Alberta</b>	Dr. Gordon Court Provincial Wildlife Status Biologist Resource Data and Species at Risk Fish and Wildlife Division Dept. of Sustainable Resource Development Government of Alberta 7th Floor, O.S. Longman Building 6909 - 116 Street Edmonton AB T6H 4P2	Steve Brechtel Head Resource Data and Species at Risk Fish and Wildlife Division Dept. of Sustainable Resource Development Government of Alberta 7th Floor, O.S. Longman Building 6909 - 116 Street Edmonton AB T6H 4P2
<b>British Columbia</b>	David F. Fraser Endangered Species Specialist Biodiversity Branch Terrestrial Ecosystem Science Section Ministry of Water, Land and Air Protection Government of British Columbia P.O. Box 9338 - Station Prov Govt Victoria BC V8V 9M1	Susan Pollard Endangered Species Specialist Biodiversity Branch Aquatic Ecosystem Science Section B.C. Ministry of Water, Land and Air Protection Government of British Columbia P.O. Box 9338 - Station Prov Govt Victoria BC V8W 9M1
<b>Manitoba</b>	William George Watkins Wildlife and Ecosystem Protection Branch Manitoba Conservation P.O. Box 24 200 Saulteaux Crescent Winnipeg MB R3J 3W3	Martin Erickson Fisheries Biologist Aquatic Ecosystem Section Fisheries Branch Manitoba Water Stewardship Box 20, 200 Saulteaux Crescent Winnipeg MB R3J 3W3

Jurisdiction	Member	Member
<b>New Brunswick</b>	Dr. Maureen Toner Biologist Species at Risk Program Fish and Wildlife Branch Department of Natural Resources Hugh John Flemming Forestry Centre P. O. Box 6000 Fredericton NB E3B 5H1	Pascal Giasson Manager Species at Risk Program Fish and Wildlife Branch Department of Natural Resources Hugh John Flemming Forestry Centre P. O. Box 6000 Fredericton NB E3B 5H1
<b>Newfoundland and Labrador (For all Species other than Marine Fish)</b>	Dr. Isabelle Schmelzer Ecosystem Management Ecologist Wildlife Division Department of Environment & Conservation Government of Newfoundland and Labrador P.O. Box 2007 117 Riverside Drive Corner Brook NL A2H 7S1	Shelley Moores Senior Wildlife Biologist Wildlife Division Department of Environment & Conservation Government of Newfoundland and Labrador P.O. Box 2007 117 Riverside Drive Corner Brook NL A2H 7S1
<b>Newfoundland and Labrador (Marine Pelagic and Demersal Fish Species)</b>	Tom Dooley Director Sustainable Fisheries & Oceans Policy Division Department of Fisheries and Aquaculture Government of Newfoundland and Labrador P.O. Box 8700 St. John's NL A1B 4J6	<u>Paul Glavine</u> Fishery Resource Planning Supervisor Sustainable Fisheries & Oceans Policy Division Department of Fisheries and Aquaculture Government of Newfoundland and Labrador P.O. Box 8700 St. John's NL A1B 4J6
<b>Northwest Territories</b>	Dr. Suzanne Carrière Ecosystem Management Biologist Wildlife Division Department of Environment and Natural Resources Government of the Northwest Territories P.O. Box 1320 Yellowknife NT X1A 2L9	Tom Lakusta Manager, Forest Resources Forest Management Department of Environment and Natural Resources Government of the Northwest Territories PO Box 1320 Yellowknife NT X1A 2L9
<b>Nova Scotia</b>	Dr. J. Sherman Boates Manager Biodiversity Department of Natural Resources Government of Nova Scotia 136 Exhibition Street Kentville NS B4N 4E5	Mark F. Elderkin Species at Risk Biologist Nova Scotia Dept. of Natural Resources Government of Nova Scotia 136 Exhibition Street Kentville NS B4N 4E5

Jurisdiction	Member	Member
<b>Nunavut Territory</b>	Chris Hotson Senior Legislation and Management Biologist Department of Environment Government of Nunavut PO Box 209 Igloodik NU X0A 0L0	Vacant
<b>Ontario</b>	Alan Dextrase Senior Species at Risk Biologist Biodiversity Section Fish & Wildlife Branch Natural Resource Management Division Ontario Ministry of Natural Resources P.O. Box 7000 Peterborough ON K9J 8M5	Michael Oldham Botanist/Herpetologist Ontario Natural Heritage Information Centre (NHIC) Ontario Ministry of Natural Resources P.O. Box 7000 Peterborough ON K9J 8M5
<b>Prince Edward Island</b>	<u>For Terrestrial Species</u> Rosemary Curley Program Manager Protected Areas and Biodiversity Conservation Forests, Fish and Wildlife Division Department of Environment, Energy and Forestry P.O. Box 2000 Charlottetown PE C1A 7N8  <u>For Freshwater Species</u> Rosanne MacFarlane Freshwater Fisheries Biologist Forests, Fish and Wildlife Division Department of Environment, Energy and Forestry P.O. Box 2000 Charlottetown PE C1A 7N8	<u>For Marine Species</u> Barry MacPhee Manager, Marine Fisheries Fisheries & Aquaculture Division Department of Agriculture, Fisheries & Aquaculture P.O. Box 2000 Charlottetown PE C1A 7N8
<b>Quebec (Plants)</b>	Jacques Labrecque Botaniste Ministère du Développement durable, de l'Environnement et des Parcs Direction du patrimoine écologique et des parcs 4e étage 675, boul. René-Lévesque Est Québec QC G1R 5V7	Vacant
<b>Quebec (Fauna)</b>	Daniel Banville Biologiste Ministère des Ressources naturelles et de la Faune Secteur Faune Québec 2 <sup>e</sup> étage 880, chemin Ste-Foy Québec QC G1S 2L4	Jacques Jutras Biologiste Ministère des Ressources naturelles et de la Faune Secteur Faune Québec 2 <sup>e</sup> étage 880, chemin Ste-Foy Québec QC G1S 2L4



<b>Jurisdiction</b>	<b>Member</b>	<b>Member</b>
<b>Saskatchewan</b>	Jeanette Pepper Zoologist Biodiversity Conservation Section Fish & Wildlife Branch Department of Environment Government of Saskatchewan 2 <sup>nd</sup> Floor, 3211 Albert Street Regina SK S4S 5W6	Dr. Robert Wright Forest Plant Ecologist Forest Practices and Accountability Unit Forest Service Branch Department of Environment Government of Saskatchewan 3211 Albert Street Regina SK S7N 5W6
<b>Yukon Territory</b>	Thomas Jung Senior Biologist Fish and Wildlife Branch Department of Environment Government of Yukon P.O. Box 2703 Whitehorse YT Y1A 2C6	<b>Bruce Bennett</b> Wildlife Viewing Biologist Yukon Department of Environment Wildlife Viewing Program V5A Box 2703 Whitehorse YT Y1A 2C6
<b>Federal Biodiversity Information Partnership (Canadian Museum of Nature)</b>	Dr. Lynn Gillespie Research Scientist Canadian Museum of Nature P.O. Box 3443 - Station D Ottawa ON K1P 6P4	Jennifer Doubt Chief Collection Manager – Botany Canadian Museum of Nature P.O. Box 3443 - Station D Ottawa ON K1P 6P4
<b>Environment Canada (Canadian Wildlife Service)</b>	Dr. Theresa Fowler Science Advisor/ Species Assessment Biologist Population Conservation & Management Division Canadian Wildlife Service Environment Canada Ottawa ON K1A 0H3	Alain Branchaud Species at Risk Biologist Centre Saint-Laurent Environment Canada 105 McGill Street Montreal QC H2Y 2E7
<b>Department of Fisheries and Oceans</b>	Cecilia Lougheed Fish Population Science Ecosystem Science Fisheries and Oceans Canada 200 Kent Street Station 12S035 Ottawa ON K1A 0E6	<b>Patrice Simon</b> Environment and Biodiversity Science Fisheries and Oceans Canada 200 Kent Street, Station 12S036 Ottawa ON K1A 0E6
<b>Parks Canada</b>	Dr. Gilles Seutin Coordinator Species at Risk Program Parks Canada 25 Eddy Street, 4 <sup>th</sup> Floor Gatineau QC K1A 0M5	Dr. Patrick Nantel Conservation Biologist Species at Risk Program Parks Canada 25 Eddy Street, 4th Floor Gatineau QC K1A 0M5

**Table 2. Co-chairs of the Aboriginal Traditional Knowledge Subcommittee and Species Specialist Subcommittees, with dates of appointment and the ending date of their terms of office**

AS REQUESTED IN A LETTER TO THE MINISTER OF THE ENVIRONMENT DATED MAY 31, 2008 FROM THE CHAIR OF COSEWIC, THE NOMINEES FOR APPOINTMENT ARE INDICATED IN BOLD AND UNDERLINED IN THE LIST BELOW. THE APPOINTMENTS WILL BE EFFECTIVE FROM JANUARY 1, 2009 TO DECEMBER 31, 2012.

Subcommittee	Name	Date Appointed	Term Ending
<b>Aboriginal Traditional Knowledge</b>	Henry Lickers Mohawk Council of Akwesasne Department of the Environment P.O. Box 579 Cornwall ON K6H 5T3	05/06/2003	31/12/2010
	Larry Carpenter Wildlife Management Advisory Council, - Northwest Territories P.O. Box 2120 Inuvik NT X0E 0T0	05/06/2003	31/12/2011
<b>Amphibians and Reptiles Specialist</b>	Dr. Ronald J. Brooks Department of Zoology College of Biological Science University of Guelph Guelph ON N1G 2W1	05/06/2003	31/12/2010
	<b><u>Dr. David M. Green</u></b> Redpath Museum McGill University 859 Sherbrooke Street West Montréal QC H3A 2K6	05/06/2003	31/12/2012
<b>Arthropods Specialist</b>	<b><u>Dr Paul M. Catling</u></b> Research Scientist and Curator Biodiversity, National Program on Environmental Health Agriculture and Agri-food Canada Research Branch Wm. Saunders Bldg., Central Experimental Farm Ottawa ON K1A 0C6	01/01/2005	31/12/2012
	Dr. Laurence Packer Department of Biology York University 4700 Keele Street Toronto ON M3J 1P3	01/01/2007	31/12/2010
<b>Birds Specialist</b>	Richard Cannings 1330 East Debeck Road R.R. 1, Site 11 - Comp. 96 Naramata BC V0H 1N0	05/06/2003	31/12/2008

Subcommittee	Name	Date Appointed	Term Ending
	Dr. Marty L. Leonard Department of Biology Dalhousie University 1355 Oxford Street Halifax NS B3H 4J1	05/06/2003	31/12/2010
<b>Freshwater Fishes Specialist</b>	Dr. Robert Campbell 983 Route 800 E R.R. #1 St. Albert ON K0A 3C0	05/06/2003	31/12/2009
	Dr. Eric B. Taylor Associate Professor Department of Zoology University of British Columbia 6270 University Boulevard Vancouver BC V6T 1Z4	01/01/2008	31/12/2011
<b>Marine Fishes Specialist</b>	Dr. Howard Powles 53 rue Lortie Gatineau QC J9H 4G6	01/01/2006	31/12/2009
	Dr. Paul Bentzen Professor Department of Biology, Dalhousie University Halifax NS B3H 4J1	01/01/2006	31/12/2011
<b>Marine Mammals Specialist</b>	Dr. Jane Watson Malaspina University College 900 5 <sup>th</sup> Street Nanaimo BC V9R 5S5	01/01/2008	31/12/2011
	<u>Dr. Randall Reeves</u> Okapi Wildlife Associates 27 Chandler Lane Hudson QC J0P 1H0	01/01/2005	31/12/2012
<b>Mosses and Lichens Specialist</b>	Dr. René Belland Devonian Botanic Garden University of Alberta Edmonton AB T6G 2E1	05/06/2003	31/12/2011
<b>Molluscs Specialist</b>	Robert Forsyth P.O. Box 3804 Smithers BC V8T 3Y7	01/01/2007	31/12/2010
	Janice L. Smith Aquatic Ecosystem Impacts Research Branch National Water Research Institute Environment Canada Burlington ON L7R 4A6	01/01/2005	31/12/2008
	<u>Dr. Dwayne Lepitzki</u> P.O. Box 1311 Banff AB T1L 1B3	01/01/2009	31/12/2012

Subcommittee	Name	Date Appointed	Term Ending
Terrestrial Mammals Specialist	Dr. Marco Festa-Bianchet Department of Biology Sherbrooke University Sherbrooke, QC J1K 2R1	05/06/2003	31/12/2008
	Dr. Mark Brigham Department of Biology University of Regina Regina, SK S4S 0A2	01/01/2006	31/12/2009
	<b><u>Dr. Justina Ray</u></b> Faculty of Forestry University of Toronto 720 Spalding Avenue, #600 Toronto, Ontario M5S 2T9	01/01/2009	<b>31/12/2012</b>
Vascular Plants Specialist	Dr. Erich Haber c/o National Botanical Services 604 Wavell Avenue Ottawa ON K2A 3A8	05/06/2003	31/12/2009

**Table 3. COSEWIC Non-government Science Members with dates of appointment and the ending date of their terms of office**

**AS REQUESTED IN A LETTER TO THE MINISTER OF THE ENVIRONMENT DATED MAY 31, 2008 FROM THE CHAIR OF COSEWIC, THE NOMINEE FOR APPOINTMENT IS INDICATED IN BOLD AND UNDERLINED IN THE LIST BELOW. THE APPOINTMENT WILL BE EFFECTIVE FROM JANUARY 1, 2009 TO DECEMBER 31, 2012.**

Name	Date Appointed	Term Ending
Michael Bradstreet Nature Conservancy of Canada Ontario Administrative Centre 115 Front Street P.O. Box 520 Port Rowan ON N0E 1M0.	05/06/2003	31/12/2011
Dr. Jeannette Whitton Associate Professor and Director, UBC Herbarium Department of Botany University of British Columbia 3529-6270 University Boulevard Vancouver BC V6T 1Z4	01/01/2007	31/12/2010
<b><u>Dr. Jeffrey Hutchings</u></b> Department of Biology Dalhousie University 1355 Oxford Street Halifax NS B3H 4J1	05/06/2003	<b>31/12/2012</b>

## APPENDIX III



## Biosketches of Proposed New/Renewed Members

### Co-chair

#### **Amphibians & Reptiles Specialist Subcommittee Recommendation – Dr. David M. Green (renewal)**

Dr. David M. Green received his Ph.D. in Zoology from the University of Guelph in 1982. He is a Professor at McGill University and Director of the Redpath Museum with over 110 peer-reviewed publications on amphibians. He has supervised or is currently supervising 20 graduate students doing projects on amphibians and reptiles (9 M.Sc., 4 Ph.D. graduated; 5 M.Sc., 2 Ph.D. ongoing). He is past Chair of COSEWIC (1998-2002), a Co-chair of the Amphibians and Reptiles Subcommittee since 1995 and a member of the Amphibians and Reptiles Subcommittee since 1985.

### Co-chair

#### **Arthropods Specialist Subcommittee Recommendation – Dr. Paul M. Catling (renewal)**

Dr. Paul M. Catling:

*Current Position, Degrees and Biological Science Background* since 2001, classified as Research Scientist, Level 4, Biological Resources Division of Agriculture Canada, 28 years experience with the Biosystematics Research Center/Biological Resources as a plant systematist, ecologist and curator of plant collections;

PhD, Toronto, on systematics and ecology of plants

18 years on the faculty of University of Ottawa

about 700 publications on odonates and lepidoptera, including books, book chapters, refereed journal articles and government documents, and over 350 botany publications

*Other relevant experience (conservation biology, taxonomy, ecology, genetics, population biology etc)*

11 years experience gathering data on the distribution of dragonflies in Canada including extensive Ontario work and some in NWT

serves on many advisory committees ( Canadian Expert Committee on Plant Genetic Resources, Species Survival Commission, Nature Conservancy)

#### *Geographic Areas/ Taxa*

odonates of Canada, most provinces, especially Ontario and NWT

lepidoptera of Ontario

expert knowledge of flora of Canada

publications in ornithology (10), mycology(1), herpetology(6)

#### *Determining Biological Status of Species*

prepared status reports on some Ontario lepidoptera and a COSEWIC status report on the goldenseal

participated in status ranking of plants and insects in Ontario and odonates in NWT .

Contributed to COSEWIC Species Assessment Meetings during past four years.

*Knowledge of Concepts and Techniques Related to Assessment and Conservation of SAR*  
has wide experience in studying rare flora and fauna and rare habitats such as alvars and grasslands; has identified streams where rare odonates are found for possible protection measures. Served on COSEWIC for four years.

involved in 4 recovery teams including the team for the butterfly, bog elfin and the goldenseal; prepared monitoring plans, and publicizes recovery team approaches

*Editorial Roles, Manuscripts, Journals,*

assesses over 100 manuscripts, grant applications and theses per annum  
associate editor of Canadian Field Naturalist, and the journal "Biodiversity"  
currently editing conference proceedings.

**Co-chair**

**Marine Mammals Specialist Subcommittee**

**Recommendation - Dr. Randall R. Reeves (renewal)**

Dr. Randall R. Reeves:

- B.A. - University of Nebraska, Lincoln, Nebraska, USA
- M.P.A. - Princeton University, Princeton, New Jersey, USA
- Ph.D. - McGill University, Montreal

Dr. Reeves has been a self-employed researcher and writer for more than 30 years, during which time he has compiled an impressive record of quality scientific work and of leadership in the conservation of marine mammals. Dr. Reeves has served on a number of national and international committees, most notably the Cetacean Specialist Group of the International Union for Conservation of Nature (IUCN) of which he has been chair since 1997, as well as the various incarnations of the COSEWIC subcommittee devoted to marine mammals (1990 to present). He is the author or co-author of over 200 scientific or popular articles on marine mammals and is co-author or co-editor of several books and special issues of scientific journals. His writings include both technical and general treatment of the ecology of marine mammals, reviews of human impact on marine mammal populations (e.g. historic catches, live-capture and trade, offshore oil development), technical guides, workshop summaries, species status reports and conservation/management plans and guidelines. Dr. Reeves has conducted fieldwork at sites that span continents, including the Eastern Canadian Arctic, Alaska, and the North Atlantic, and is therefore well placed to address the status of Atlantic and Arctic species, as specified in the COSEWIC call for applicants. In short, Dr. Reeves has a solid track record across the range of targeted skills, from strong science, to collaboration, to production of reports, and would therefore be an excellent choice as Co-Chair of the Marine Mammal Species Specialist Subcommittee.

**Co-chair**  
**Molluscs Specialist Subcommittee**  
**Recommendation: Dr. Dwayne Lepitzki (new)**

Dr. Dwayne A.W. Lepitzki is an independent biologist on contract with Parks Canada since 1994 working on a variety of aquatic projects (giant liver flukes, amphibians, thermal spring micro and macroinvertebrates) as well as the COSEWIC and SARA listed endangered Banff Springs Snail, *Physella johnsoni*. He has a B.Sc. (1st class honours) in Zoology from the University of Alberta (1983), an M.A. in Zoology from Southern Illinois University at Carbondale (Cooperative Wildlife Research Laboratory) (1986), and a Ph.D. in Parasitology from McGill University (1993). His Ph.D. dissertation entitled "Epizootiology and transmission of snail-inhabiting metacercariae of the duck digeneans *Cyathocotyle bushiensis* and *Sphaeridiotrema globulus*" involved work on aquatic snail communities in southern Quebec and southeastern Ontario. His undergraduate degree involved work on terrestrial snails and slugs acting as intermediate hosts for ungulate parasites in western Canada. He has been the Principal Investigator on the Parks Canada research and recovery program for the Banff Springs Snail since 1996; wrote the original (1997) and updated (2007) COSEWIC and Alberta (2002) status reports on the snail; assigned preliminary status ranks to all terrestrial and aquatic gastropods in Alberta (2001); is an inaugural member of the Banff Springs Snail Recovery Team; was the first author on the Parks Canada approved Resource Management Plan for the Recovery of the Snail (2002); is the first author on the Recovery Strategy and Action Plan for the snail (2007); and is the Canadian coordinator of the current American Fisheries Society project assigning a status rank to all North American freshwater gastropods. He has authored or co-authored over 15 peer reviewed, published papers, over 40 internal reports including Environmental Assessments, and has presented his research findings at over 30 regional, national, and international conferences from Victoria, British Columbia to Liverpool England. Dr. Lepitzki has been a member of the COSEWIC Molluscs Specialist Subcommittee since 2005.

**Co-chair**  
**Terrestrial Mammals Specialist Subcommittee**  
**Recommendation: Dr. Justina Ray (new)**

Dr. Ray has been executive director of Wildlife Conservation Society Canada since its incorporation in 2004. In addition to overseeing the operations of this non-governmental organization, she is a wildlife biologist by training, having graduated from University of Florida with a Ph.D. in 1996. Her dissertation subject was the community ecology of forest carnivores in Central Africa. She has extensive research and conservation experience in tropical forests, although North America has been her predominant focus over the past decade. The questions that drive her research are rooted in evaluating the role of shifting landscapes in biodiversity decline and/or change in forested ecosystems. These issues include quantifying the impacts of development activities on biodiversity (especially logging and hunting), including effects of forest changes on mammal population and community structure, and monitoring of species at risk. In Canada, Dr. Ray is involved in research and policy activities associated with conservation planning in northern landscapes, with a particular focus on wolverine and caribou.

Dr. Ray has served on numerous government-led advisory panels formulating policy and legislation, including: Ontario Wolverine Recovery Team, Ontario Woodland Caribou Science Review Panel, the Nova Scotia Marten and Lynx Recovery Team, and the Lake Simcoe Science Advisory Committee. During 2006-2007, she served on the Endangered Species Act Review Advisory Panel for the Ontario Ministry of Natural Resources through to the passage of a new Act in May 2007. More recently, she participated on the federal Boreal Caribou Science Advisory Group for the Critical Habitat Science Review.

Dr. Ray has authored or co-authored more than thirty book chapter, journal, or popular articles, and is lead editor of the book *Large Carnivores and the Conservation of Biodiversity* (Island Press; March, 2005), co-editor of *Noninvasive Survey Techniques for North American Carnivores* (Island Press, 2008), and co-author of the forthcoming *Caribou and the North: A Shared Future* (Dundurn Press, 2008). She is Adjunct Professor at the Faculty of Forestry, University of Toronto and Trent University, and Research Associate at the Center for Biodiversity and Conservation Biology at the Royal Ontario Museum. She is co-chair of the Board of Directors of Two Countries, One Forest (a Northern Appalachians conservation network).

#### **Non-Government Science Member**

##### **Recommendation: Dr. Jeffrey Hutchings (renewal)**

Dr. Hutchings received a Ph. D. from Memorial University in 1991 and conducted postdoctoral research at the University of Edinburgh and at the Department of Fisheries and Oceans in St. John's. He became a faculty member at Dalhousie University in 1995 and is currently a Professor of Biology and Canada Research Chair in Marine Conservation & Biodiversity. Dr. Hutchings has compiled an impressive record of research focussing on the conservation of marine fishes and the ecology of gadid and salmonid fishes. Dr. Hutchings has published more 110 publications in the peer-reviewed literature (including sentinel publications on exploited marine species), 11 Technical Reports, and is well known for his interest in the communication of science to Canadian Society. Dr. Hutchings also authored the 2003 COSEWIC status report on Atlantic Cod.

Dr. Hutchings has considerable knowledge and experience with respect to the biology and management of Canadian marine, anadromous and freshwater fishes. He is most knowledgeable regarding Atlantic Canadian marine and freshwater environments and freshwater environments in Ontario. Dr. Hutchings was a member of the COSEWIC Marine Fishes SSC since its inception in 1999 until 2007. He has been a Non-Government Science Member of COSEWIC since 2001. This has given him a strong foundation in species assessment and in formulating recommendations with respect to biological status. Dr. Hutchings has also published several peer-reviewed papers addressing the application of the IUCN criteria which have been adopted by COSEWIC.

Dr. Hutchings has broad experience as an editor for scientific journals and also has a proven record of working well collaboratively as a member of various panels and advisory committees in addition to his work on COSEWIC. He has supervised 5 postdoctoral fellows, 22 graduate students, and 15 honours students. Dr. Hutchings has served as Chair of COSEWIC since May 2006.



## APPENDIX IV



## **Guidelines for recognizing Designatable Units below the Species Level**

**Revised and approved by COSEWIC in April 2008**

### **Preamble:**

It is widely recognised that status assessments and the conservation of biological diversity require that units below the species level (using "species" in the accepted sense of the taxonomic hierarchy) be considered when appropriate. The Species at Risk Act includes "subspecies, varieties or geographically or genetically distinct population" in its definition of wildlife species. This recognizes that conservation of biological diversity requires protection for taxonomic entities below the species level (i.e. Designatable Units or DUs), and gives COSEWIC a mandate to assess those entities when warranted.

### **Approach to the status assessment of DUs below the species level:**

COSEWIC may assess DUs below the species level when a single status designation is thought not to reflect the probability of extinction of the wildlife species.

Designatable Units should be discrete and evolutionarily significant units of the taxonomic species, where "significant" means that the unit is important to the evolutionary legacy of the wildlife species as a whole and if lost would likely not be replaced through natural dispersion.

Following is a set of guidelines to assist in the identification of Designatable Units for the purpose of status assessment by COSEWIC. The guidelines should be seen as aids for identifying DUs and not as rigid criteria.

### **Guidelines for the identification of DUs:**

#### **1) Subspecies or varieties:**

A unit may be recognized as a DU if it represents a named subspecies or variety identified in accordance with COSEWIC's guidelines for naming subspecies and varieties. COSEWIC may choose not to recognize a named subspecies or variety as a DU if current scientific data do not support its validity.

#### **2) Discrete and evolutionarily significant populations:**

A population or group of populations may be recognized as a DU if it has attributes that make it "discrete" and evolutionarily "significant" relative to other populations.

The first step in identifying DUs is to ask whether the population or group of populations is discrete from other populations.

## Discreteness

A population or group of populations may be considered discrete based on one or more of the following criteria:

1. Evidence of genetic distinctiveness including, but not limited to, inherited traits (e.g. morphology, life history, behaviour) and/or neutral genetic markers (e.g. allozymes, DNA microsatellites, DNA restriction fragment length polymorphisms (RFLPs), DNA sequences).
2. Natural disjunction between substantial portions of the wildlife species' geographic range, such that movement of individuals between separated regions has been severely limited for an extended period of time and is not likely in the foreseeable future and where the disjunction is likely to favour the evolution of local adaptations.
3. Occupation of differing eco-geographic regions that are relevant to the wildlife species and reflect historical or genetic distinction, as may be depicted on an appropriate ecozone or biogeographic zone map (Figs. 1 - 3). Some dispersal may occur between regions, but it is insufficient to prevent local adaptation.

## Significance

If a population or group of populations is considered discrete, based on one or more of the above criteria, then its significance may next be considered. A population may be considered significant based on, but not limited to, one or more of the following criteria, each of which can be considered a measure of evolutionary significance:

1. Evidence that the discrete population or group of populations differs markedly from others in genetic characteristics thought to reflect relatively deep intraspecific phylogenetic divergence. Such differences would typically be manifested as qualitative genetic differences at relatively slow-evolving markers (e.g. fixed differences in mitochondrial or nuclear DNA sequences or fixed differences in alleles at multiple nuclear loci). Quantitative (frequency) differences of shared alleles, especially for rapidly-evolving markers such as microsatellites, generally would not be sufficient to meet this criterion.
2. Persistence of the discrete population or group of populations in an ecological setting unusual or unique to the wildlife species, such that it is likely or known to have given rise to local adaptations.
3. Evidence that the discrete population or group of populations represents the only surviving natural occurrence of a wildlife species that is more abundant elsewhere as an introduced population outside of its historical range.
4. Evidence that the loss of the discrete population or group of populations would result in an extensive gap in the range of the wildlife species in Canada.

It is important to recognize that some criteria provide more compelling evidence of "discreteness" and "significance" than others; hence, when identifying a DU, it is important to present the best available evidence for all criteria that are met.

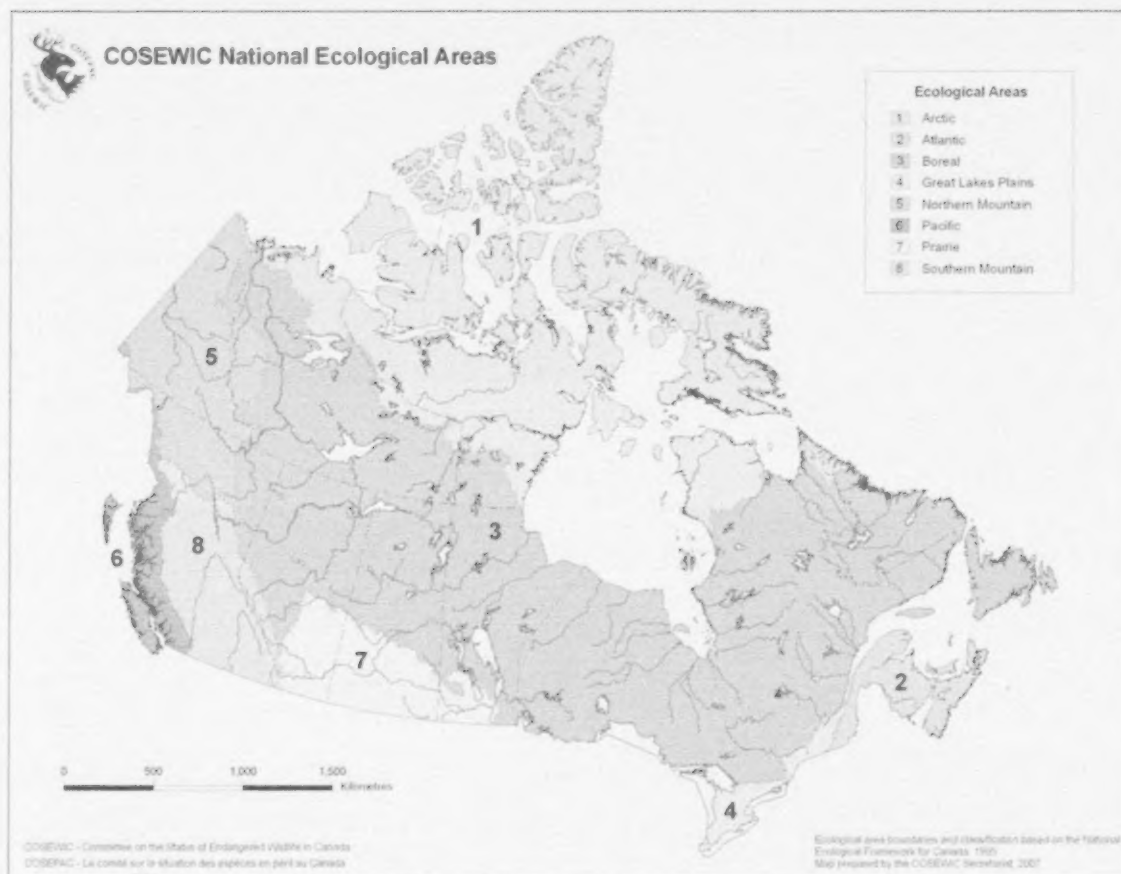


Figure 1. COSEWIC National Ecological Areas.

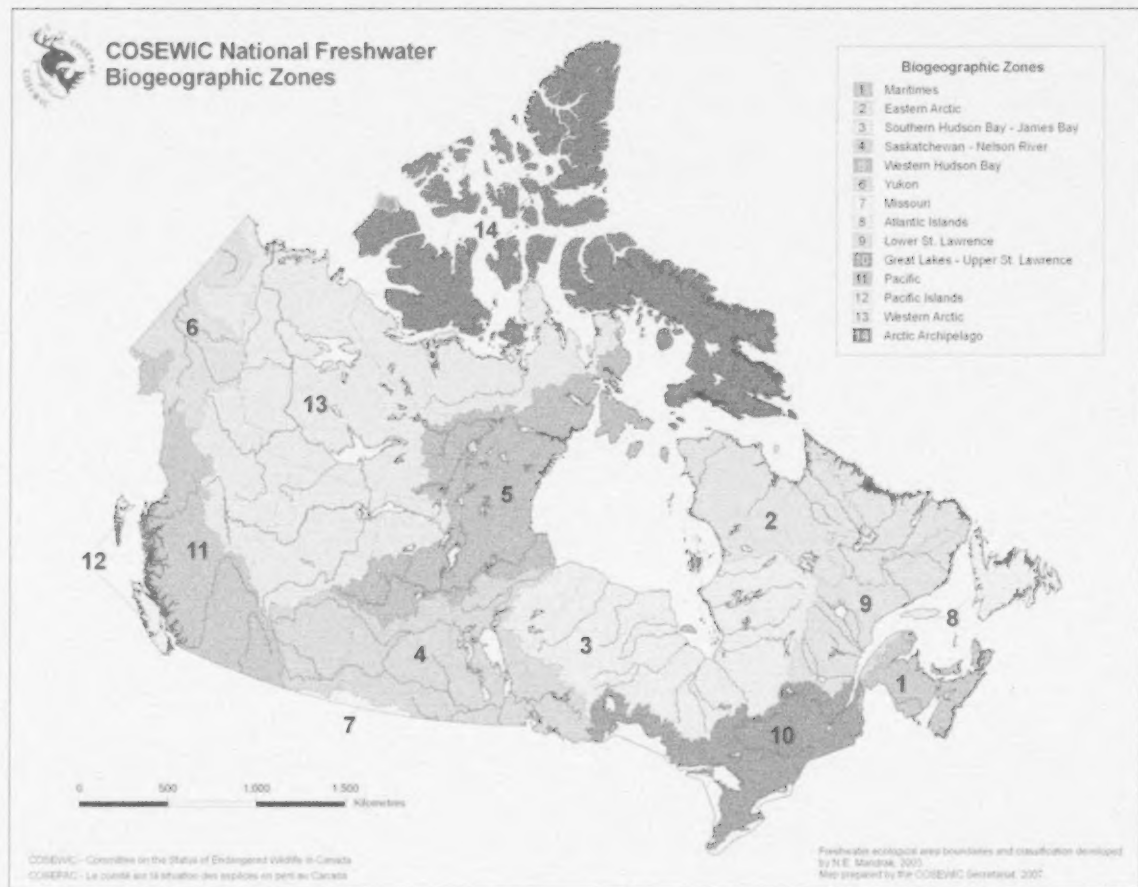


Figure 2. COSEWIC National Freshwater Biogeographic Zones

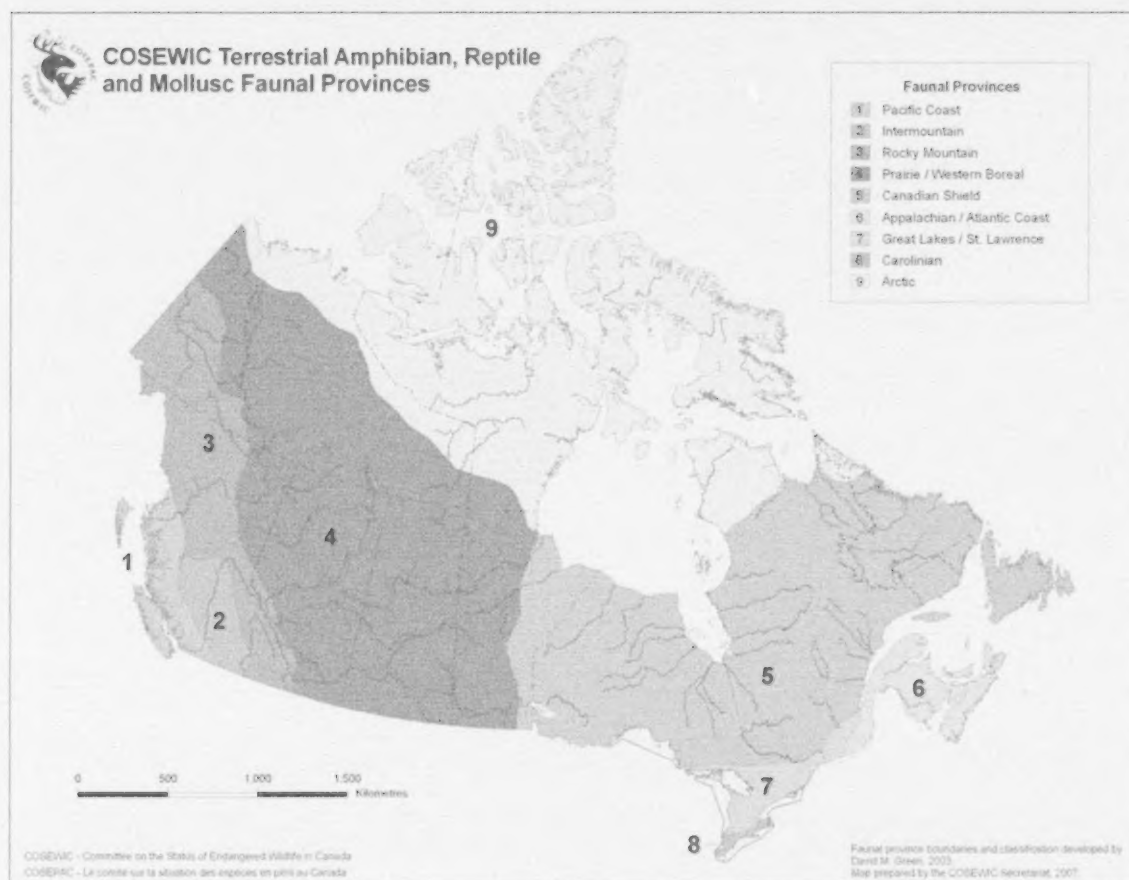


Figure 3. COSEWIC Terrestrial Amphibians, Reptiles, and Mollusc Faunal Provinces



## APPENDIX V

## **Cosewic Guidelines on Manipulated Populations**

**Approved by COSEWIC  
April 2008**

In response to the increasing numbers of species whose distribution or genetic make-up have been manipulated by humans, deliberately or accidentally, these guidelines have been developed to assist COSEWIC in determining the eligibility of populations for inclusion in wildlife species status assessments.

COSEWIC normally only considers native species for assessment (see Definitions below), excluding species introduced to Canada via human intervention. Appendix E3 provides no clear direction for the assessment of native species that include (re-) introduced, hybrid, supplemented or captive populations. The SARA definition of wildlife species includes the term 'wild by nature' which, according to some legal interpretations, could include captive individuals with recent wild ancestors. The IUCN, to which COSEWIC consults for guidance, as necessary, provides advice on the assessment of introduced or re-introduced populations, as discussed in section 1 below; however, advice for other types of manipulated populations is not explicit.

Species status reports will indicate clearly whether manipulated populations are included or excluded in status assessments. However, the exclusion of a manipulated group of individuals from a status assessment does not necessarily mean that such individuals are also excluded from the definition of wildlife species under SARA.

Prohibitions specified by SARA may apply to both wild and manipulated individuals, unless the latter can be assessed as a population that is either genetically or geographically distinct from populations in the wild. Some manipulated populations may clearly be genetically distinct, depending on the number of generations for which they have been manipulated. Other manipulated populations, for which sufficient time may not have elapsed for genetic differences to have arisen, could be considered geographically distinct. COSEWIC's "Guidelines for Recognizing Designatable Units Below the Species Level" provide criteria for determining whether geographical differences can be considered to exist between a manipulated population and one or more wild populations. In particular, range disjunction arises when "dispersal of individuals between separated regions has been severely limited for an extended period of time and is not likely in the foreseeable future" (COSEWIC Operations and Procedures Manual, Appendix F5). Thus, if a manipulated population has been established for reasons other than conservation, such as for commercial purposes, and the conditions of confinement are such that it is not possible for individuals in captivity to interbreed with wild population(s), then the manipulated population might be considered by COSEWIC to be geographically distinct, and identified as such in the species status report.

These guidelines clarify COSEWIC's position on eligibility for assessment for manipulated populations. Some flexibility must be maintained to enable the most appropriate conservation measures under a wide range of circumstances across taxonomic groups.

These guidelines consider four types of manipulated populations:

1. introduced/re-introduced
2. hybrid
3. supplemented
4. captive

Genetically modified organisms will always be excluded from species status assessments, although they may be identified as a threat.

**Guideline #1: Status reports should clearly indicate which populations are included and excluded from the wildlife species being assessed and why, including whether and on what basis populations are geographically or genetically distinct. Status reports should identify known hybrid, reintroduced, supplemented, captive or cultivated populations and explain the known or potential impacts of those populations, or in some cases individuals, on the conservation of the wildlife species being assessed. Status reports should also describe the history of changes in assessed units. Populations or individuals excluded from assessment because of known or suspected negative impacts on wildlife species should be identified as a threat in the status report, if appropriate.**

### **1. Introduced/Reintroduced Populations**

Numerous plant and animal species have been either introduced to new areas within (intra-limital) or outside (extra-limital) their native range or reintroduced to areas they previously occupied within their native range as a result of intentional or unintentional human activities. Eligibility of such established, (re)introduced populations may depend on whether or not the introduction is intra-limital or extra-limital and on its predicted or demonstrated impact to the wildlife species in its native range and on other components of biodiversity.

i) Reintroductions occur within the native range and in the natural habitat of a wildlife species. They may include translocations (establishment in a new area, using wild individuals from another area within the native range) or reintroductions to an area where a wildlife species has been extirpated. Reintroductions may include populations established from escaped or intentionally transplanted, captive-reared/maintained populations that themselves were established using individuals from within the native range of the wildlife species. For example, swift foxes were reintroduced to the Canadian prairies using both captive-reared and wild-caught foxes from American prairie states. Similarly, captive-bred peregrine falcons were released in parts of Canada where they had been extirpated.

Regardless of the intent or means of the original introduction (conservation-based or not, intentional or not), the IUCN recommends that self-sustaining populations resulting from translocations and reintroductions be included in species assessments (Standards and Petitions Working Group 2006).

**Guideline #2: COSEWIC will generally only include populations established from intra-limital reintroductions, regardless of intent, predicted or demonstrated to have a positive impact on the wildlife species being assessed. A positive impact would**

**result in an increase in the average fitness of individuals of the wildlife species (reflected, for example, by an increased probability of survival, increased population growth rate, and/or increased ability to adapt to environmental change).**

**Reintroduced individuals must have produced viable offspring before they are counted as mature individuals in a species status assessment.**

(ii) Extra-limital introductions are outside the historical range of the wildlife species and may originate from translocated wild individuals or captive-reared individuals. For example, Westslope cutthroat trout populations in the North Saskatchewan and Ram River drainages of Alberta, established using hatchery-reared individuals, are outside the historic range of the wildlife species.

The IUCN includes populations resulting from extra-limital introductions in assessments if the intent of those introductions was for conservation and if there is no suitable habitat remaining within the historic range of the species. These are considered benign introductions. For status assessment purposes, it may be acceptable to include populations introduced for commercial as well as conservation purposes. However, an extra-limital population is geographically distinct (i.e., outside the natural range) and may not meet the definition of wildlife species under SARA if it was established as a result of human intervention. In either case, where no populations remain within the historic range, the IUCN indicates the species should be considered Extinct in the Wild<sup>1</sup>. Currently, COSEWIC does not include this category in its assessments.

**Guideline #3: COSEWIC will generally only include populations resulting from benign extra-limital introductions as part of the wildlife species if there is no suitable habitat remaining within the natural range of the species in Canada.**

## **2. Hybrid populations**

Interbreeding can occur along a continuum ranging from between individuals from different populations of the same taxonomic species to between individuals from different biological species. Rhymer and Simberloff (1996) define hybridization as 'interbreeding of individuals from what are believed to be genetically distinct populations, regardless of the taxonomic status'. Although hybridization usually refers to mating between heterospecific individuals, it can also apply to mating between individuals of different sub-species or genetically differentiated populations. There is no universally accepted biological species concept (Hey 2006, Haig et al. 2006), and the definition of subspecies is even more controversial (Haig et al. 2006). Consequently, the level of hybridization should not define a rigid threshold for assessment or conservation purposes. Rather, when considering hybrid populations for assessment, the consequences of the hybridization should be examined from an evolutionary perspective. The more genetically differentiated the two groups, the greater the probability of consequences such as outbreeding depression and the loss of adaptive gene complexes. Alternatively, for small populations where inbreeding depression is evident, introductions of novel genotypes from non-native sources may be beneficial. Natural hybridization and gene flow play an important role in the continuing evolution of

<sup>1</sup> The IUCN uses the category Extinct in Wild to apply to a species that 'is only known to survive in cultivation, in captivity or as a naturalized population well outside the past range' (Standards and Petitions Working Group 2006) (see Benign Introduction).



some organisms and in the maintenance of genetic diversity. The following sections consider these concepts further in the context of two types of mechanisms resulting in hybridization.

**Mechanism(s) producing hybridization:**

(i) **Natural hybridization** - Some hybridization (i.e., the production of offspring as a result of interbreeding between recognized biological species or subspecies) occurs independently of human activities and may result in new biological species or novel recombinant genotypes (see references in Stein and Uy 2006, also Seehausen 2004). Hybrid zones in which two closely related taxa naturally overlap in distribution occur in several taxonomic groups and may remain stable when parental genotypes maintain their integrity (Hagen and Taylor 2001) or continue to change (unidirectional introgression, Stein and Uy 2006). Furthermore, hybridization is considered a common feature of parapatric or sympatric divergence (Mallet 1995), and it can be followed by stabilization and perpetuation of the hybrid derivative as a distinct taxonomic entity (Stebbins 1969). One example of natural hybridization is that between steelhead trout and coastal cutthroat trout, where the two species naturally occur together, and the Misty Lake stickleback, where 'intermediate' hybrid forms between the stream and lake ecotypes are part of the evolutionary process. Hybrids resulting from interbreeding between the wildlife species under assessment and cultivated individuals (see Definitions below) originating from the same wildlife species are not considered to be the product of natural hybridization.

**Guideline #4: Populations undergoing natural hybridization are eligible for inclusion in species assessments by COSEWIC. Mature individuals could, in this case, include hybrids.**

(ii) Human-mediated hybridization – Hybridization can be a direct or indirect consequence of human activities. Activities affecting hybridization directly include the introduction of individuals from a genetically distinct population into the native range of another genetically distinct population or the intentional crossbreeding of two genetically distinct populations, regardless of taxonomic status. Human activities that can indirectly lead to hybridization include the destruction or modification of suitable habitat and the removal of reproductive barriers (including geographical, physical or behavioural) that previously existed between the two genetically distinct native populations.

The result of the initial hybridization event between two pure parental genotypes is an  $F_1$  hybrid. Hybrids may be sterile, have reduced fitness, or be fully capable of breeding with other  $F_1$ s or of backcrossing with parental genotypes. Although hybrids that are sterile or have low fitness may not affect the genetic composition of the pure populations, they represent a loss to production and may pose a risk to the viability of at least one parental population, particularly if it is small. Backcrossing and continued successful breeding can lead to increasing levels of genetic introgression resulting in: (1) hybrid swarms where neither of the original pure genotypes exists or (2) unidirectional introgression with the loss of one of the pure parental populations.

Where human-mediated hybridization occurs,  $F_1$  hybrids and their introgressed progeny should generally be considered a loss to the wildlife species and a threat to



its persistence; hybrids do not represent either original taxonomic group, and they do not contribute to the evolutionary lineage of either group. For example, many populations of westslope cutthroat trout in Alberta have experienced introgression of genes from artificially introduced rainbow trout and Yellowstone cutthroat trout. However, for closely related taxa, it may be very difficult to differentiate between ancient polymorphism shared by the two groups and low levels of introgression. For example, Allendorf et al. (2004) proposed an introgression threshold for westslope cutthroat trout populations; a population may be considered genetically pure if it expresses <1% introgression (i.e. 1% or fewer individuals in a population are considered backcrossed). This threshold should be assessed from assays from an adequate sample of diagnostic selectively neutral molecular markers and individuals that results in at least a 95% probability that a minimum 1% introgression will be identified if it is occurring in the population.

**Guideline #5: If introgression is known or suspected, COSEWIC will consider whether it is likely to negatively affect the conservation of the wildlife species. A negative impact is one predicted to result in a reduction in the average fitness of individuals of the wildlife species being assessed (reflected, for example, by a reduced probability of survival, reduced population growth rate, and/or reduced ability to adapt to environmental change). Under these circumstances, F<sub>1</sub> hybrids, if identifiable, and their progeny would not be included in the assessment. Where introgression in a population is considered extensive, it may be prudent to exclude the entire population from the wildlife species being assessed.**

Exceptions may exist where the gene pool of a wildlife species is so small that inbreeding depression is evident, and genetic variability cannot be increased using individuals from the same genetic pool. In such situations, it may be prudent to interbreed the wildlife species with another closely related population of the same wildlife species to increase genetic variability and benefit from hybrid vigour, particularly where the wildlife species in question is otherwise expected to go extinct. This will at least preserve some of the genetic composition of the wildlife species and may restore its ecological role. However, the resultant recombinant population may be assessed as a separate designatable unit, with the original one considered extinct. Furthermore, this recombinant population would only be eligible if it is not dependent on continued introductions to persist and it does not pose a threat to the donor wildlife species contributing to the interbreeding efforts.

### **3. Supplemented Populations**

Supplemented populations are native populations that receive captive bred/reared (or cultivated) individuals or wild-to-wild translocations, intentionally or unintentionally. To be considered in assessments, introduced individuals must be known to reproduce in the wild and to have negligible or positive effects on the wildlife species under consideration. Supplementation can be accomplished using individuals originating from the same population or a genetically distinct population of the same biological species.

Supplementation is frequently undertaken to provide harvestable individuals. Supplementation has also been used to rebuild depressed or genetically depauperate

populations, as is being attempted with captive reared Vancouver Island marmots. Unplanned supplementation may occur if individuals escape from captivity or cultivation and contribute to recruitment in a wild population. There is also a conservation technique known as 'head-starting', which involves keeping individuals from natural populations in captivity (either *in-situ* or *ex-situ*) during a particularly vulnerable life stage, usually near birth or germination. For example, head-starting can decrease predation on caribou calves.

**Guideline #6: Regardless of the intent of supplementation, individuals used to supplement wild populations and resultant naturally-produced offspring should generally be included as part of the wildlife species only if these individuals are predicted to have a positive impact on the wildlife species being assessed. Evidence of artificial selection or genetic characteristics that may corrupt local adaptations would render these individuals ineligible for inclusion. Furthermore, evidence that the supplemented wild population has been corrupted would render the population ineligible for inclusion in the wildlife species being assessed.**

#### **4. Captive or Cultivated Populations**

Captive and cultivated populations may be maintained for *ex situ* conservation or commercial purposes, respectively. For example, captive breeding might be an integral component of recovery programmes for species unable to survive in the wild under current conditions. Reproduction may or may not be based on pedigree tracking, and human intervention may be required for successful breeding. Such populations may be founded by wild-caught individuals from a single source, or result from the mixing of disparate genetic sources, some of which may have been subjected to artificial selection. For example, captive-breeding programmes of swift fox, peregrine falcon and Vancouver Island marmot either are or have been in place in Canada in the recent past. Artificial selection for traits best suited to captivity begins immediately upon being contained in a captive environment (e.g. Lynch and O'Hely 2001); this is called domestication selection. The greater the number of generations in captivity, the greater the effect of domestication on heritable traits and non-heritable, learned behaviours. Although efforts to minimize domestication have been made in some conservation-based captive breeding programmes, such changes are impossible to prevent entirely.

**Guideline #7: Captive and cultivated populations should be excluded from status assessments, provided these populations can be distinguished from wild populations. The term 'extirpated' may be used in assessment for wildlife species that only exist in captivity.**

For example, Atlantic salmon are cultivated in floating netpens for commercial aquaculture purposes. These groups of individuals would be excluded from the populations being assessed, except to be considered a threat if and where escapee cultivated fish pose a risk to the survival of wild Atlantic salmon populations.

**Definitions:**

**Benign Introduction** – (adapted from IUCN definition) – An attempt to establish a taxon, for the purpose of conservation, outside of its recorded distribution but within an appropriate habitat and eco-geographical area; a feasible conservation tool only when there is no remaining area left within the natural range of a taxon.

**Captive population** – A group of individuals resulting from the process of breeding in a human-controlled environment, usually with the intent of releasing the individuals, or their offspring, into the wild.

**Cultivated population** – A population no longer in the natural state; developed by human care and for human use (e.g., for commercial purposes).

**Designatable Unit** (COSEWIC definition) – Subspecies, variety, or geographically or genetically distinct population that may be recognized by COSEWIC where a single status designation for a wildlife species is not sufficient to accurately portray probabilities of extinction within the wildlife species.

**Extinct** (COSEWIC definition) – A wildlife species that no longer exists.

**Extirpated** (COSEWIC definition) – A wildlife species that no longer exists in the wild in Canada, but exist elsewhere.

**Genetically modified organisms** – Plants or animals produced by the process of directly transferring or modifying genetic material, using recombinant DNA techniques.

**Native Wildlife Species** (COSEWIC definition) – A wildlife species that occurs in Canada naturally, or that has expanded its range into Canada without human intervention from a region where it naturally occurred, has produced viable populations, and has persisted in Canada for at least 50 years.

**Natural range** – (adapted from IUCN) – Range of taxon, excluding any portion that results from an introduction to another region or neighbouring region. The delimitation between wild and introduced populations within a region may be based on a preset year or event when there is a biological justification for doing so.

**Population** (COSEWIC definition adapted from IUCN) – A geographically or otherwise distinct group within a wildlife species that has little demographic or genetic exchange with other such groups. Theoretically, populations maintain genetic distinction if there is typically less than one successful breeding immigrant individual or gamete per generation. Equivalent to the term 'subpopulation' as employed by the IUCN (Source: adapted from IUCN 2001).

**Re-introduction** (IUCN definition) – An attempt to establish a wildlife species (or taxonomically defined unit within a wildlife species) in an area which was once part of its historical range, but from which it has been extirpated; re-establishment is a synonymy with the added caveat that the attempt has been successful.

**Supplementation** (IUCN definition) – addition of individuals to an existing population of conspecifics; also called re-enforcement.

**Translocation** (IUCN definition) – Deliberate and mediated movement of wild individuals or populations from one part of their range to another.

**Wild Population** (IUCN definition) – A population within its natural range in which the individuals are the result of natural production (i.e. not the result of human-mediated release or translocation); if a population is the result of a benign introduction that is now or has previously been successful (i.e. self-sustaining), the population is considered wild.

**Wildlife Species** (COSEWIC definition) – A species, subspecies, variety or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.



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## APPENDIX VI

## **Guidelines for use of the Index of Area of Occupancy (IAO) in COSEWIC Assessments**

**Approved by COSEWIC  
April 2008**

Area of Occupancy is a biological measure of the occupied habitat within a species' range. When estimated at a scale that is biologically relevant to a species, area of occupancy can provide insights into the species habitat requirements, threats and limitations, and, if data are available over time, valuable trend information. This is important biological information that is relevant to assessment criteria and as contextual information for assessment. It is important to keep in mind that COSEWIC uses area of occupancy in two ways. First, it uses it in a very specific way in the form of an index tied to thresholds in the quantitative criteria. For clarity this treatment of area of occupancy is referred to as Index of Area of Occupancy or IAO. Area of Occupancy is also used in its more general sense as a biological defensible estimate of the occupied habitat within a species' range. Note that in the later case, this information cannot be used within the quantitative criteria but can be important to the overall assessment. This information is to be used as a contextual consideration as part of assessment step 4, or in step 5, where the results of the assessment are evaluated against the definitions of the assessment categories (O and P Manual pages 45-47).

Index of Area of Occupancy (IAO) is used by COSEWIC as part of Criteria B and D. The size of COSEWIC's IAO for a species is compared against threshold values in the COSEWIC criteria to identify species with a restricted distribution or small population size and thereby species which may have an elevated risk of extirpation or extinction. Because the estimated size of IAO is dependent on the scale at which it is measured, it is important to use a consistent scale when determining IAO for use in the COSEWIC criteria. COSEWIC has determined that an IAO measured at a scale of 2x2 km<sup>2</sup> (or, sometimes, 1x1 km<sup>2</sup> as detailed below) is appropriate for use with the criteria.

COSEWIC's definition for Index of Area of Occupancy is provided in Appendix C of the Operations and Procedures Manual. The COSEWIC guidelines for calculating and reporting IAO are provided in Part A, below. These recommendations were accepted by COSEWIC in November 2006 based on analyses provided by the Criteria Working Group of COSEWIC.

### **A. COSEWIC guidelines for calculating and reporting IAO.**

1. COSEWIC will adopt a 2x2 km grid for the calculation of IAO, as a matter of routine, so that the criterion thresholds for IAO can be applied in a consistent and meaningful manner.
2. A 1x1 km grid may be used if (a) enough data are available and (b) the smaller grid is justified (e.g. a very specific habitat requirement such as freshwater or sand dunes). Refer to IUCN section 4.10.6 for caveats regarding use of a 1x1 grid for "linear" habitats.

Both the 2x2 and 1x1 IAO should be reported so that they can be compared with one another and against the thresholds. The rationale for the recommended use of the 1x1

must be provided in the status report. It is up to the COSEWIC membership to determine which of the two estimates are most appropriate for assessment.

Note that IAO is never used in isolation when applying the quantitative criteria; there is always some other indicator of risk of extinction that must be met, such as decline rate, severe fragmentation, few locations, threats etc.

3. Area of occupancy information other than IAO estimates may also be relevant to a status assessment and inclusion of this information in the status report is encouraged. When Area of Occupancy rather than IAO is estimated this must be biologically defensible, that is enough data and information must be available, including where the species occurs and does not occur, that an accurate estimate of occupied habitat can be made. These estimates cannot be used in combination with the grid-size dependent thresholds. Estimates of Area of Occupancy are to be discussed in relation to the affect on extinction risk as part of the consideration of contextual considerations in step 4 of the assessment or in step 5 where the results of criteria and guideline application are compared with the definitions of the assessment categories (see O an P Manual Section 5.4.2 pages 45-47).

## **B. COSEWIC process for calculating IAO.**

As indicated in the *Instructions to Status Report Authors*, report authors must contact the Secretariat regarding calculation of IAO. SCC Co-chairs are also encouraged to contact the Secretariat if they require assistance or have questions with IAO. If questions cannot be resolved please refer them to the Criteria Working Group.

## **C. Guidance: IUCN guidelines for IAO and Area of Occupancy**

Information and guidance on the use of IAO can be found in *Section 4.10 of Guidelines for Using the IUCN Red List Categories and Criteria* and is provided below.

Note that there is some confusion in this document regarding area of occupancy in general and the grid-method used in the criteria context. For the most part the IUCN use of AOO is the same as COSEWIC IAO.

Area of Occupancy (AOO) is a parameter that represents the area of suitable habitat currently occupied by the taxon. As any area measure, AOO requires a particular scale. In this case, the scale is determined by the thresholds in the criteria, i.e. valid use of the criteria requires that AOO is estimated at scales that relate to the thresholds in the criteria. These scales (see "Problems of scale" below) are intended to result in comparable threat status across taxa; other scales may be more appropriate for other uses. For example, much smaller scales are appropriate for planning conservation action for plants, and larger scales may be appropriate for global gap analysis for large mobile species. However, such scales may not be appropriate for use with the criteria.

Area of Occupancy is included in the criteria for two main reasons. The first is to identify species with restricted spatial distribution and, thus usually with restricted habitat. These species are often habitat specialists. Species with a restricted habitat are considered to have an increased risk of extinction. Secondly, in many cases, AOO can be

a useful proxy for population size, because there is generally a positive correlation between AOO and population size. The veracity of this relationship for any one species depends on variation in its population density.

Suppose two species have the same EOO, but different values for AOO, perhaps because one has more specialized habitat requirements. For example, two species may be distributed across the same desert (hence EOO is the same), but one is wide ranging throughout (large AOO) while the other is restricted to oases (small AOO). The species with the smaller AOO may have a higher risk of extinction because threats to its restricted habitat (e.g. degradation of oases) are likely to reduce its habitat more rapidly to an area that cannot support a viable population. The species with the smaller AOO is also likely to have a smaller population size than the one with a larger AOO, and hence is likely to have higher extinction risks for that reason.

#### 4.10.1 Problems of scale

Classifications based on the area of occupancy (AOO) may be complicated by problems of spatial scale. There is a logical conflict between having fixed range thresholds [in the criteria] and the necessity of measuring range at different scales for different taxa. "The finer the scale at which the distributions or habitats of taxa are mapped, the smaller the area will be that they are found to occupy, and the less likely it will be that range estimates ... exceed the thresholds specified in the criteria. Mapping at finer spatial scales reveals more areas in which the taxon is unrecorded. Conversely, coarse-scale mapping reveals fewer unoccupied areas, resulting in range estimates that are more likely to exceed the thresholds for the threatened categories. The choice of scale at which AOO is estimated may thus, itself, influence the outcome of Red List assessments and could be a source of inconsistency and bias." (IUCN 2001) Some estimates of AOO may require standardization to an appropriate reference scale to reduce such bias. Below, we first discuss a simple method of estimating AOO, then we make recommendations about the appropriate reference scale, and finally we describe a method of standardization for cases where the available data are not at the reference scale.

#### 4.10.2 Methods for estimating AOO

There are several ways of estimating AOO, but for the purpose of these guidelines we assume estimates have been obtained by counting the number of occupied cells in a uniform grid that covers the entire range of a taxon (see Figure 2 in IUCN 2001), and then tallying the total area of all occupied cells:

$$\text{AOO} = \text{no. occupied cells} \times \text{area of an individual cell (equation 4.1)}$$

The 'scale' of AOO estimates can then be represented by the area of an individual cell in the grid (or alternatively the length of a cell, but here we use area). There are other ways of representing AOO, for example, by mapping and calculating the area of polygons that contain all occupied habitat. The scale of such estimates may be represented by the area of the smallest mapped polygon (or the length of the shortest polygon segment), but these alternatives are not recommended.



#### 4.10.3 The appropriate scale

It is impossible to provide any strict but general rules for mapping taxa or habitats; the most appropriate scale will depend on the taxon in question, and the origin and comprehensiveness of the distribution data. However, we believe that in many cases a grid size of 2 km (a cell area of 4 km<sup>2</sup>) is an appropriate scale. Scales of 3.2 km grid size or coarser (larger) are inappropriate because they do not allow any taxa to be listed as Critically Endangered (where the threshold AOO under criterion B is 10 km<sup>2</sup>). Scales of 1 km grid size or smaller tend to list more taxa at higher threat categories than these categories imply. However, if the available data were obtained as the result of high-intensity sampling, these finer scales may be appropriate. In other words, in order to use a finer scale of, say, 1 km grid size, the assessors should be reasonably certain that empty 1 km<sup>2</sup> cells represent real "absences" rather than "undetected presences". For most other cases, we recommend a scale of 4 km<sup>2</sup> cells as the reference scale. If an estimate was made at a different scale, especially if data at different scales were used in assessing species in the same taxonomic group, this may result in inconsistencies and bias. In any case, the scale for AOO should not be based on EOO (or other measures of range area), because AOO and EOO measure different factors affecting extinction risk (see above). If AOO can be calculated at the reference scale of 4 km<sup>2</sup> cells, you can skip sections 4.10.4 and 4.10.5. If AOO cannot be calculated at the reference scale (e.g., because it has already been calculated at another scale and original maps are not available), then the methods described in the following two sections may be helpful.

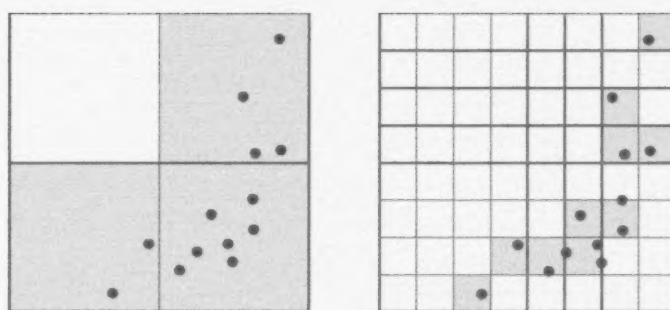
#### 4.10.4 Scale-area relationships

We recommended reducing the biases caused by use of range estimates made at different scales by standardizing estimates to a reference scale that is appropriate to the thresholds in the criteria. This and the following section discuss the scale-area relationship that forms the background for these standardization methods, and describe such a method with examples. The method of standardization depends on how AOO is estimated. In the following discussion, we assume that AOO was estimated using the grid method summarised above. The standardization or correction method we will discuss below relies on the relationship of scale to area, in other words, how the estimated AOO changes as the scale or resolution changes. Estimates of AOO may be calculated at different scales by starting with mapped locations at the finest spatial resolution available, and successively doubling the dimensions of grid cells. The relationship between the area occupied and the scale at which it was estimated may be represented on a graph known as an area-area curve (e.g., Figure 4.3). The slopes of these curves may vary between theoretical bounds, depending on the extent of grid saturation. A maximum slope = 1 is achieved when there is only one occupied fine-scale grid cell in the landscape (fully unsaturated distribution). A minimum slope = 0 is achieved when all fine-scale grid cells are occupied (fully saturated distribution).

#### 4.10.5 Scale correction factors

Estimates of AOO may be standardized by applying a scale-correction factor. Scale-area relationships (e.g., Figure 4.3) provide important guidance for such standardization. It is not possible to give a single scale-correction factor that is suitable for all cases because different taxa have different scale-area relationships. Furthermore, a suitable correction factor needs to take into account a reference scale (e.g., 2 km grid size) that is appropriate to the area of





grid length	grid area	AOO
1	1	10
2	4	24
4	16	48
8	64	64
16	256	256
32	1024	1024

**Figure 4.3.** Illustration of scale-dependence when calculating area of occupancy. At a fine scale (map on right) AOO = 10 x 1 = 10 units<sup>2</sup>. At a coarse scale (map on left) AOO = 3 x 16 = 48 units<sup>2</sup>. AOO may be calculated at various scales by successively doubling grid dimensions from estimates at the finest available scale (see Table). These may be displayed on an area-area curve (above).

occupancy thresholds in criterion B. The example below shows how estimates of AOO made at fine and coarse scales may be scaled up and down, respectively, to the reference scale to obtain an estimate that may be assessed against the AOO thresholds in Criterion B.

#### Example: Scaling Up

Assume that estimates of AOO are available at 1km grid resolution shown in Figure 4.3 (right) and that it is necessary to obtain an estimate at the reference scale represented by a 2 km grid. This may be done cartographically by simply doubling the original grid dimensions, counting the number of occupied cells and applying equation 4.1. When the reference scale is not a geometric multiple of the scale of the original estimate, it is necessary to calculate an area-area curve, as shown in Figure 4.3, and interpolate an estimate of AOO at the reference scale. This can be done mathematically by calculating a scale correction factor (C) from the slope of the area-area curve as follows:

$$C = (\log_{10}(AOO_2/AOO_1)/\log_{10}(Ag_2/Ag_1)) \text{ (equation 4.2)}$$

Where AOO<sub>1</sub> is the estimated area occupied from grids of area Ag<sub>1</sub>, a size close to, but smaller than the reference scale, and AOO<sub>2</sub> is the estimated area occupied from grids of

area  $Ag_2$ , a size close to, but larger than the reference scale. An estimate of  $AOO_R$  at the reference scale,  $Ag_R$ , may thus be calculated by rearranging equation 2 as follows:

$$AOO_R = AOO_1 * 10^{C * \log(Ag_R / Ag_1)} \quad (\text{equation 4.3})$$

In the example shown in Figure 4.3, estimates of AOO from 1x1 km and 4x4 km grids may be used to verify the estimate AOO at the reference scale of 2x2 km from the as follows:

$$C = (\log_{10}(48/10) / \log(16/1)) = 0.566, \text{ and}$$

$$AOO = 48 * 10^{0.566 * \log(4/16)} = 22 \text{ km}^2$$

Note that this estimate differs slightly from the true value obtained from grid counting and equation 1 ( $24 \text{ km}^2$ ) because the slope of the area-area curve is not exactly constant between the measurement scales of 1x1 km and 4x4 km.

#### Example: Scaling Down

Scaling down estimates of AOO is more difficult than scaling up because there is no quantitative information about grid occupancy at scales finer than the reference scale. Scaling therefore requires extrapolation, rather than interpolation of the area-area curve. Kunin (1998) and He and Gaston (2000) suggest mathematical methods for this. A simple approach is to apply equation 4.3 using an approximated value of C.

An approximation of C may be derived by calculating it at coarser scales, as suggested by Kunin (1998). For example, to estimate AOO at 2x2 km when the finest resolution of available data is at 4x4 km, we could calculate C from estimates at 4x4 km and 8x8 km as follows.

$$C = (\log(64/48) / \log(64/16)) = 0.208$$

However, this approach assumes that the slope of the area-area curve is constant, which is unlikely to hold for many taxa across a moderate range of scales. In this case, AOO at 4x4 km is overestimated because C was underestimated.

$$AOO = 48 * 10^{0.208 * \log(4/16)} = 36 \text{ km}^2$$

While mathematical extrapolation may give some guidance in estimating C, there may be qualitative information about the dispersal ability, habitat specificity and landscape patterns that could also provide guidance. Table 4.1 gives some guidance on how these factors may influence the values of C within the range of scales between 2x2 km and 10x10 km grid sizes.

**Table 4.1.** Characteristics of organisms and their habitat that influence the slope of the scale-area relationship, and hence the scale-correction factor, *C*, within the range of spatial scales represented by 2x2 km and 10x10 km grid cells.

Biological characteristic	Influence on <i>C</i>	
	small (approaching 0)	large (approaching 1)
Dispersal ability	Wide	localised or sessile
Habitat specificity	Broad	Narrow
Habitat availability	Extensive	Limited

For example, if the organism under consideration was a wide-ranging animal without specialized habitat requirements in an extensive and relatively uniform landscape (e.g., a species of camel in desert), its distribution at fine scale would be relatively saturated and the value of *C* would be close to zero. In contrast, organisms that are either sessile or wide ranging but have specialized habitat requirements that only exist in small patches within the landscape (e.g., migratory sea birds that only breed on certain types of cliffs on certain types of islands) would have very unsaturated distributions represented by values of *C* close to one. Qualitative biological knowledge about organisms and mathematical relationships derived from coarse-scale data may thus both be useful for estimating a value of *C* that may be applied in equation 4.3 to estimate AOO at the reference scale.

Finally, it is important to note that if unscaled estimates of AOO at scales larger than the reference value are used directly to assess a taxon against thresholds in criterion B, then the assessment is assuming that the distribution is fully saturated at the reference scale (i.e., assumes *C* = 0). In other words, the occupied coarse-scale grids are assumed to contain no unsuitable or unoccupied habitat that could be detected in grids of the reference size.

#### 4.10.6 "Linear" habitat

There is a concern that grids do not have much ecological meaning for taxa living in "linear" habitat such as in rivers or along coastlines. Although this concern is valid, for the purpose of assessing taxa against criterion B, it is important to have a measurement system that is consistent with the thresholds, and that leads to comparable listings. If AOO estimates were based on estimates of length x breadth of habitat, there may be very few taxa that exceed the VU threshold for Criterion B (especially when the habitats concerned are streams or beaches a few metres wide). In addition, there is the problem of defining what a "linear" habitat is, and measuring the length of a jagged line. Thus, we recommend that the methods described above for estimating AOO should be used for taxa in all types of habitat distribution, including taxa with linear ranges living in rivers or along coastlines.

#### 4.10.7 AOO based on habitat maps and models

Habitat maps show the distribution of suitable habitat for a species. They may be derived from interpretation of remote imagery and/or analyses of spatial environmental data using simple combinations of GIS data layers, or by more formal statistical habitat models (e.g. generalised linear and additive models, decision trees, Bayesian models, regression trees, etc.). Habitat maps can provide a basis for estimating AOO and EOO and, if maps

are available for different points in time, rates of change can be estimated. They cannot be used directly to estimate a taxon's AOO because they map an area that is larger than the occupied habitat (i.e. they also map areas of suitable habitat that may presently be unoccupied). However, they may be a useful means of estimating AOO indirectly, provided the three following conditions are met.

- i) Maps must be justified as accurate representations of the habitat requirements of the species and validated by a means that is independent of the data used to construct them.
- ii) The mapped area of suitable habitat must be interpreted to produce an estimate of the area of occupied habitat.
- iii) The estimated area of occupied habitat derived from the map must be scaled to the grid size that is appropriate for AOO of the species.

Habitat maps can vary widely in quality and accuracy (condition i). A map may not be an accurate representation of habitat if key variables are omitted from the underlying model. For example, a map would over-estimate the habitat of a forest-dependent montane species if it identified all forest areas as suitable habitat, irrespective of altitude. The spatial resolution of habitat resources also affects how well maps can represent suitable habitat. For example, specialised nest sites for birds, such as a particular configuration of undergrowth or trees with hollows of a particular size, do not lend themselves to mapping at coarse scales. Any application of habitat maps to Red List assessment, should therefore be subject to an appraisal of mapping limitations, which should lead to an understanding of whether the maps over-estimate or under-estimate the area of suitable habitat.

Habitat maps may accurately reflect the suitable habitat, but only a fraction of suitable habitat may be occupied (condition ii). Low habitat occupancy may result because other factors are limiting – such as availability of prey, impacts of predators, competitors or disturbance, dispersal limitations, etc. In such cases, the area of mapped habitat could be substantially larger than AOO and will therefore need to be adjusted (using an estimate of the proportion of habitat occupied) to produce a valid estimate of AOO. This may be done by random sampling of suitable habitat grid cells, which would require multiple iterations to obtain a stable mean value of AOO. Habitat maps are produced at a resolution determined by the input data layers (satellite images, digital elevation models, climate surfaces, etc.). Often these will be at finer scales than those required to estimate AOO (condition iii), and consequently scaling up will be required.

In those cases where AOO is less than the area of suitable habitat, the population may be declining within the habitat, but the habitat may show no indication of change. Hence this method could be both inaccurate and non-precautionary for estimating reductions in population change.

However, if a decline in mapped habitat area is observed (and the map is a reasonable representation of suitable habitat – condition i), then the population is likely to be declining at least at that rate. This is a robust generalisation because even the loss of unoccupied habitat can reduce population viability. Thus, if estimates of AOO are not available, then the observed decline in mapped habitat area can be used to invoke "continuing decline" in criteria B and C, and the rate of such decline can be used as a basis for calculating a lower bound for population reduction under Criterion A.

## APPENDIX VII



## COSEWIC Species Assessments (detailed version), November 2007\*

Results are grouped by taxon and then by status category. A reason for designation is given for each species. A short history of status designations follows. The range of occurrence in Canada for each species (by province, territory, or ocean) is provided.

### Mammals

**Harbour Seal Lacs des Loups Marins subspecies**

*Phoca vitulina mellonae*

**Endangered**

Assessment Criteria C2a(i,ii); D1

Reason for Designation

This land-locked subspecies is endemic to Québec and may number as few as 100 individuals. It inhabits a small series of lakes in northern Québec and is the only subspecies to live entirely in fresh water. The population has declined due to hunting and may still be declining. Proposed hydro-electric development would cause pervasive changes to the habitat.

Range QC

Status History

Designated Special Concern in April 1996. Status re-examined and designated Endangered in November 2007.

**Harbour Seal Atlantic and Eastern Arctic subspecies**

*Phoca vitulina concolor*

**Not at Risk**

Assessment Criteria not applicable

Reason for Designation

The total population has not been estimated, and analyses have not been undertaken to determine whether there is significant subpopulation structure. Overall the subspecies is common and believed to be adaptable to change. It is often found in marine areas used by people and is susceptible to shooting. No serious immediate threats have been identified over any substantial part of its range.

Range NU MB ON QC NB PE NS NL Arctic Ocean Atlantic Ocean

Status History

Species considered in April 1999 and placed in the Data Deficient category. Re-examined in November 2007 and designated Not at Risk.

### Birds

**Olive-sided Flycatcher**

*Contopus cooperi*

**Threatened**

Assessment Criteria Does not strictly meet any of the criteria, but assessed as Threatened because of a 79% decline from 1968 to 2006, a 29% decline since 1996, and because there is no evidence that the decline has ceased.

Reason for Designation

This songbird has shown a widespread and consistent population decline over the last 30 years; the Canadian population is estimated to have declined by 79% from 1968 to 2006 and 29% from 1996-2006. The causes of this decline are uncertain.

Range YT NT BC AB SK MB ON QC NB PE NS NL

Status History

Designated Threatened in November 2007.

## **Reptiles**

### **Eastern Hog-nosed Snake**

*Heterodon platirhinos*

**Threatened**

Assessment Criteria B2ab(iii)

#### Reason for Designation

This species faces several threats, particularly increased mortality and severe habitat fragmentation caused by an expanding road network and increased traffic. The species is mobile for a snake, but this mobility places it at high risk when it encounters roads. The species also suffers from persecution by humans not only because it is a relatively large snake but also because of its complex defensive threats when confronted. In southwest Ontario and south of the Canadian shield, the species has suffered extensive habitat loss from agriculture and rapid increase in housing development. Poaching for the illegal wildlife trade is a growing threat.

Range ON

#### Status History

Designated Special Concern in April 1997. Status re-examined and designated Threatened in November 2001 and November 2007.

### **Wood Turtle**

*Glyptemys insculpta*

**Threatened**

Assessment Criteria B2ab(iii,v); C1+2a(i)

#### Reason for Designation

This species is declining across much of its range, and occurs in small, increasingly disjunct populations. It is more terrestrial than other freshwater turtles, which makes it extremely vulnerable to collection for the pet trade. It has a long-lived life history typical of turtles, so that almost any chronic increase in adult and juvenile mortality leads to a decrease in abundance. Such increased mortality is occurring from increased exposure to road traffic, agricultural machinery and off-road vehicles, collection for pets, and perhaps exotic food/medicines. Increased level of threat is associated with new or increased access to areas by people.

Range ON QC NB NS

#### Status History

Designated Special Concern in April 1996. Status re-examined and designated Threatened in November 2007.

## **Amphibians**

### **Coeur d'Alene Salamander**

*Plethodon idahoensis*

**Special Concern**

Assessment Criteria not applicable

#### Reason for Designation

The species has a restricted range in southeastern British Columbia and a limited area of occupancy. It is highly dependent on moist, shaded, faulted, rock outcrops, which are scattered throughout the otherwise dry landscape of the Southern Columbia Mountains. The climate in this region, which is characterized by extremes in temperature and humidity levels, compounds the isolated nature of the populations. This species' highly specialized habitat requirements and life history increase its vulnerability to habitat disturbance and fragmentation. Road construction and small-scale hydro development are potential threats.

Range BC

#### Status History

Designated Special Concern in April 1998. Status re-examined and confirmed in November 2001 and November 2007.

## **Fishes**

### **Canary Rockfish**

### ***Sebastes pinniger***

### **Threatened**

**Assessment Criteria** Met criterion for Endangered, A2b, but designated Threatened, A2b, because the species is widely distributed, the population includes several million mature individuals, and changes in management since 1995 have improved control of the major threat.

#### **Reason for Designation**

A comparatively large (maximum weight 5.7 kg), orange-yellow fish that typically inhabits rocky bottoms at 70-270 m depths from the western Gulf of Alaska south to northern California. Its late maturity (13 years for females), long maximum lifespan (84 years), and long generation time (20-30 years) are characteristic of species that are slow to recover following population decline. The species is treated as a single designatable unit. Two surveys in the southern part of its Canadian range considered the most reliable indicators of population trend, and show abundance index declines of 80% and 96% over 30 years and 17 years respectively. Survey indices from the northern part of the range and commercial catch per unit effort indices show no consistent trends but are of relatively short duration and are in some cases based on methods which do not adequately sample areas inhabited by the species. There is uncertainty due to high variability in the various index series (characteristic of trawl surveys) and the unknown degree to which abundance trends in the southern part of the Canadian range reflect abundance trends throughout the species' range in Canadian waters. Fishing is the most likely cause of the observed decline. Changes to management since 1995 include 100% observers or video monitoring coverage and implementation of individual transferable quotas, which are expected to improve control of fishing. Rescue from contiguous populations to the south is unlikely given that current abundance in the US is estimated at 5-10% of unfished levels, and rescue from populations to the north is uncertain because their status is not well known.

**Range** Pacific Ocean

#### **Status History**

Designated Threatened in November 2007.

## **Arthropods**

### **Dusky Dune Moth**

### ***Copablepharon longipenne***

### **Endangered**

**Assessment Criteria** B2ab(ii,iii)

#### **Reason for Designation**

The species is restricted to open, active sand areas that are both fragmented and declining. Although it may be common where found, it occurs in a small proportion of the total seemingly suitable sites and has been lost from historical localities. Dispersal between dune systems is considered to be extremely unlikely. Since the 1940's, the area of suitable habitat has declined by an estimated 10-20% per decade.

**Range** AB SK MB

#### **Status History**

Designated Endangered in November 2007.

### **Pale Yellow Dune Moth**

### ***Copablepharon grandis***

### **Special Concern**

**Assessment Criteria** not applicable

#### **Reason for Designation**

Although the area of occupancy is small, there is some evidence of decline in its extent of occurrence and area of occupancy. The species persists in widely separated dune systems, the declines are not well documented, and the status of threats is unclear. It requires semi-stable sand dunes which are declining.

**Range** AB SK MB

#### **Status History**

Designated Special Concern in November 2007.

## **Vascular Plants**

### **Golden Paintbrush**

### ***Castilleja levisecta***

**Endangered**

Assessment Criteria B1ab(iii,v)+2ab(iii,v)

#### Reason for Designation

The species is a perennial hemiparasitic herb of maritime meadows found within the Garry oak ecosystem of southeastern Vancouver Island. The species has lost most of its historic populations, having once been known from 7 locations. One small population was extirpated in recent years. The species is presently reduced to two populations on two small islands in the Victoria area. The spread of invasive alien plants continues to place the species at risk on Trial Island.

Range BC

#### Status History

Designated Threatened in April 1995. Status re-examined and designated Endangered in May 2000 and in November 2007.

### **Wood-poppy**

### ***Stylophorum diphyllum***

**Endangered**

Assessment Criteria B1ab(iii)+2ab(iii)

#### Reason for Designation

A showy perennial herb of Carolinian woodlands restricted to 3 small and highly fragmented populations occupying very limited areas. The habitat is declining in quality due to the presence of invasive plants and habitat disruption due to recreational activities that increase the risk of trampling. Further potential habitat disruption may occur with the expansion of housing development and other commercial activities adjacent to two of the sites. The species is widely available from nurseries but garden-grown plants cultivated in Canada likely originate from U.S. stocks. Cultivated plants are not included in the COSEWIC assessment.

Range ON

#### Status History

Designated Endangered in April 1993. Status re-examined and confirmed in May 2000 and November 2007.

### **Yellow Montane Violet *praemorsa* subspecies**

### ***Viola praemorsa praemorsa***

**Endangered**

Assessment Criteria B1ab(iii)+2ab(iii)

#### Reason for Designation

The species is only known in Canada from southeastern Vancouver Island and the adjacent southern Gulf Islands where it occurs as 14 mainly small, localized populations that are highly fragmented. This short-lived perennial is restricted to Garry oak woodlands and maritime meadows where habitat is continuing to decline in quality due to such factors as the spread of exotic invasive grasses as well as the spread of trees and shrubs as a result of fire suppression.

Range BC

#### Status History

Designated Threatened in April 1995. Status re-examined and confirmed in May 2000. Status re-examined and designated Endangered in November 2007.

**Round-leaved Greenbrier*****Smilax rotundifolia*****Threatened****Great Lakes Plains population**

**Assessment Criteria** Met criteria for Endangered, B1ab(iii)+2ab(iii), but designated Threatened, B1ab(iii)+2ab(iii), because plants are long-lived vines reproducing vigorously by vegetative growth.

**Reason for Designation**

The species is currently known from 13 highly fragmented populations in Ontario's Carolinian Zone. Four populations have been found since the previous COSEWIC assessment due to more extensive surveys, and although no population was lost, habitat declines have occurred. Population size and trend are poorly known due to the clonal nature of the species. Many Ontario populations appear to have plants of only one sex and therefore cannot produce seed. The plants, however, are vigorous, long-lived and resistant to habitat changes.

**Range** ON**Status History**

Designated Threatened in April 1994. Status re-examined and confirmed in May 2001 and November 2007.

**Okanogan Stickseed*****Hackelia ciliata*****Not at Risk**

**Assessment Criteria** not applicable

**Reason for Designation**

This species has a small global range and a relatively restricted distribution on talus and scree slopes of south-central British Columbia. However, it does not meet any criteria because of the lack of evidence on population declines and the presence of large numbers of mature individuals contained in numerous patches that represent more than 10 populations. The populations are likely not severely fragmented because of fruit dispersal by animal vectors and there appear to be no significant threats at the present time.

**Range** BC**Status History**

Designated Not at Risk in November 2007.

**Round-leaved Greenbrier*****Smilax rotundifolia*****Not at Risk****Atlantic population**

**Assessment Criteria** not applicable

**Reason for Designation**

The species is known from at least 50 sites in southern Nova Scotia where there are estimated to be at least 3,000 to 10,000 individuals (crowns). The actual number of mature individuals for this clonal species is, however, unknown. No declines have been documented and threats are limited.

**Range** NS**Status History**

Designated Not at Risk in November 2007.

\*The assessments of Flathead Catfish (*Pylodictis olivaris*) and Lake Chubsucker (*Erimyzon sucetta*) were deferred. These species will be re-considered by COSEWIC in April 2008. The reports for Orangespotted Sunfish (*Lepomis humilis*) and Redbreast Sunfish (*Lepomis aurtus*) were withdrawn.

30/11/2007



## COSEWIC Species Assessments (detailed version), April 2008\*

Results are grouped by taxon and then by status category. A reason for designation is given for each species. A short history of status designations follows. The range of occurrence in Canada for each species (by province, territory, or ocean) is provided.

### Mammals

#### **Vancouver Island Marmot**

#### ***Marmota vancouverensis***

**Endangered**

Assessment Criteria A2a; C2a(i); D1

#### Reason for Designation

Fewer than 30 mature wild-born individuals of this Canadian endemic remain in the wild. Despite the apparent initial success of reintroductions, the wild population of this species remains extremely small and could be subject to stochastic events. Ongoing predation remains high and there are potential threats from inbreeding and climate change.

Range BC

#### Status History

Designated Endangered in April 1978. Status re-examined and confirmed Endangered in April 1997, May 2000, and April 2008.

#### **Polar Bear**

#### ***Ursus maritimus***

**Special Concern**

Assessment Criteria not applicable

#### Reason for Designation

The species is an apex predator adapted to hunting seals on the sea ice and is highly sensitive to overharvest. Although there are some genetic differences among bears from different parts of the Arctic, movement and genetic data support a single designatable unit in Canada. It is useful, however, to report trends by subpopulation because harvest rates, threats, and, hence, predicted population viability, vary substantially over the species' range. Some subpopulations are overharvested and current management mostly seeks the maximum sustainable harvest, which may cause declines if population monitoring is inadequate. Until 2006, some shared subpopulations were subject to harvest in Greenland that was not based on quotas. Population models project that 4 of 13 subpopulations (including approximately 28% of 15,500 polar bears in Canada) have a high risk of declining by 30% or more over the next 3 bear generations (36 years). Declines are partly attributed to climate change for Western Hudson Bay and Southern Beaufort Sea, but are mostly due to unsustainable harvest in Kane Basin and Baffin Bay. Seven subpopulations (about 43% of the total population) are projected to be stable or increasing. Trends currently cannot be projected for 2 subpopulations (29% of the total population). Bears in some subpopulations show declining body condition and changes in denning location linked to decreased availability of sea ice. For most subpopulations with repeated censuses, data suggest a slight increase in the last 10-25 years. All projections are based on currently available data and do not account for the possible effects of climate change. The species cannot persist without seasonal sea ice. Continuing decline in seasonal availability of sea ice makes it likely that a range contraction will occur in parts of the species range. Decreasing ice thickness in parts of the High Arctic may provide better habitat for the bears, but there is uncertainty over the overall impact of climate change on the species' distribution and numbers. Although there is uncertainty over the overall impact of climate change on the species' distribution and numbers, considerable concern exists over the future of this species in Canada.

Range YT NT NU MB ON QC NL Arctic Ocean

#### Status History

Designated Not at Risk in April 1986. Status re-examined and designated Special Concern in April 1991. Status re-examined and confirmed in April 1999, November 2002, and April 2008.

## Birds

**Greater Sage-Grouse *phaeos* subspecies**      ***Centrocercus urophasianus phaeos***      **Extirpated**

Assessment Criteria not applicable

Reason for Designation

This subspecies has not been seen in its former range in the Okanagan Valley of British Columbia for about a century.

Range BC

Status History

Has not been reported since the 1960s. Designated Extirpated in April 1997. Status re-examined and confirmed in May 2000 and April 2008.

**Greater Sage-Grouse *urophasianus* subspecies**      ***Centrocercus urophasianus urophasianus***      **Endangered**

Assessment Criteria A2b; C1

Reason for Designation

This large grouse is restricted to sagebrush grasslands in southern Alberta and Saskatchewan and has suffered significant population declines (42% over the last 10 years, 88% since 1988). The number of leks (male display sites) has decreased by 50% in the last 10 years and there are now less than a thousand breeding birds in the population. Causes for the decline are largely due to the loss, fragmentation and degradation of its native grassland habitats through oil and gas exploration, overgrazing and conversion to crops.

Range AB SK

Status History

Given conditional designation of Threatened in April 1997. Status re-examined and designated Endangered in April 1998 based on a revised status report. Status re-examined and confirmed in May 2000 and April 2008.

**Kirtland's Warbler**      ***Dendroica kirtlandii***      **Endangered**

Assessment Criteria D1

Reason for Designation

This warbler is a globally endangered species that occurs in very small numbers in Ontario and possibly Quebec. It is a habitat specialist and extremely vulnerable to cowbird nest parasitism. Habitat management and cowbird control in Michigan, the core of its range, have resulted in population increases, which could provide a source of birds for Canada. However, the U.S. population is still small and the number of sightings in Canada has remained low and constant since 1990, so there is no evidence of rescue for the Canadian population.

Range ON

Status History

Designated Endangered in April 1979. Status re-examined and confirmed in April 1999, May 2000, and April 2008.

**Spotted Owl *caurina* subspecies**      ***Strix occidentalis caurina***      **Endangered**

Assessment Criteria A2ac; B2ab(i,ii,iii,iv,v); C1+2a(i); D1; E

Reason for Designation

This owl requires old-growth forests for its survival and has suffered a catastrophic population decline over the past 50 years as habitat is lost and fragmented. With the severely depressed population, an additional threat is the recent arrival of the closely related Barred Owl as a breeding bird in B.C.; this species competes with and hybridizes with the present species. Its historical population of about 500 adult owls in Canada has been reduced to 19, and only 10 of these are in breeding pairs. All adults are old and near the end of their breeding age and there is no recruitment of young owls into the population. If current trends are not reversed, extirpation will likely occur within the next decade.

Range BC

Status History

Designated Endangered in April 1986. Status re-examined and confirmed in April 1999, May 2000, and April 2008.

<b>Canada Warbler</b>	<b><i>Wilsonia canadensis</i></b>	<b>Threatened</b>
<u>Assessment Criteria</u> A2b		
<u>Reason for Designation</u>		
Most (80%) of the breeding range of this species occurs in Canada. While regional trends may vary, overall the species has experienced a significant long-term decline. This decline is particularly evident in the case of the species' Canadian range and there is no indication that this trend will be reversed. The reasons for the decline are unclear, but loss of primary forest on the wintering grounds in South America is a potential cause.		
<u>Range</u> YT NT BC AB SK MB ON QC NB PE NS		
<u>Status History</u>		
Designated Threatened in April 2008.		
<b>Ferruginous Hawk</b>	<b><i>Buteo regalis</i></b>	<b>Threatened</b>
<u>Assessment Criteria</u> A2b		
<u>Reason for Designation</u>		
This large hawk is found primarily on natural grasslands in southern Alberta, Saskatchewan and Manitoba and is a specialist predator on Richardson's Ground Squirrels. It suffered a 64% decline in population from 1992 to 2005; since Alberta comprises the majority of the Canadian range, this implies a decline of at least 30% across the Prairies over that time period. The loss, degradation and fragmentation of its native grassland habitat are the most serious threats to the population.		
<u>Range</u> AB SK MB		
<u>Status History</u>		
Designated Threatened in April 1980. Status re-examined and designated Special Concern in April 1995. Status re-examined and designated Threatened in April 2008.		
<b>Great Blue Heron <i>fannini</i> subspecies</b>	<b><i>Ardea herodias fannini</i></b>	<b>Special Concern</b>
<u>Assessment Criteria</u> not applicable		
<u>Reason for Designation</u>		
In Canada, this subspecies is distributed along the coast of British Columbia with a relatively small population that is concentrated at a few breeding colonies in southern British Columbia. There is evidence of declines in productivity and it is unclear whether the population is stable or declining. Threats from eagle predation, habitat loss and human disturbance are ongoing, particularly in the southern part of the range where concentrations of birds are highest.		
<u>Range</u> BC		
<u>Status History</u>		
Designated Special Concern in April 1997 and April 2008.		
<b>Short-eared Owl</b>	<b><i>Asio flammeus</i></b>	<b>Special Concern</b>
<u>Assessment Criteria</u> not applicable		
<u>Reason for Designation</u>		
This owl has suffered a continuing population decline over the past 40 years, including a loss of 23% in the last decade alone. Habitat loss and degradation on its wintering grounds are most likely the major threat, while continuing habitat loss and degradation on its breeding grounds in southern Canada and pesticide use are secondary threats. This species nearly meets the criteria for Threatened status.		
<u>Range</u> YT NT NU BC AB SK MB ON QC NB PE NS NL		
<u>Status History</u>		
Designated Special Concern in April 1994 and April 2008.		

## Reptiles

### Eastern Foxsnake

### *Elaphe gloydi*

### Endangered

#### Great Lakes/St. Lawrence population

Assessment Criteria B1ab(iii)+2ab(iii)

#### Reason for Designation

In this region, the species swims long distances often in cold, rough open water where it is subject to mortality due to increasing boat traffic. It is uniquely vulnerable to habitat loss because it is confined to a thin strip of shoreline where it must compete with intense road development and habitat modification due to recreational activities. The species' habitat is undergoing increasing fragmentation as development creates zones that are uninhabitable.

Range ON

#### Status History

The species was considered a single unit and designated Threatened in April 1999 and May 2000. Split into two populations in April 2008. The Great Lakes / St. Lawrence population was designated Endangered in April 2008.

### Eastern Foxsnake

### *Elaphe gloydi*

### Endangered

#### Carolinian population

Assessment Criteria B2ab(ii,iii,iv)

#### Reason for Designation

The species is confined to a few small increasingly disjunct areas that are subject to intensive agriculture, high human populations and extremely high densities of roads. Roads fragment populations leading to increased probability of extirpation. There are no large protected, roadless areas for this species in this region. The species is also subject to persecution and illegal collection for the wildlife trade.

Range ON

#### Status History

The species was considered a single unit and designated Threatened in April 1999 and May 2000. Split into two populations in April 2008. The Carolinian population was designated Endangered in April 2008.

## Amphibians

### Western Chorus Frog

### *Pseudacris triseriata*

### Threatened

#### Great Lakes / St. Lawrence - Canadian Shield population

Assessment Criteria A2bc

#### Reason for Designation

Ongoing losses of habitat and breeding sites for this small frog due to suburban expansion and alteration in farming practices have resulted in losses of populations and isolation of remaining habitat patches. Populations in Quebec are documented to have declined at a rate of 37% over 10 years and are expected to continue to decline. Despite there being some areas where chorus frogs remain evident, surveys of populations in Ontario indicate a significant decline in abundance of 30% over the past decade.

Range ON QC

#### Status History

The species was considered a single unit and designated Not at Risk in May 2001. Split into two populations in April 2008. The Great Lakes / St. Lawrence - Canadian Shield population was designated Threatened in April 2008.

### Western Chorus Frog

### *Pseudacris triseriata*

### Not at Risk

#### Carolinian population

Assessment Criteria not applicable

#### Reason for Designation

Although there are ongoing losses of habitat and breeding sites due to urban and suburban expansion and changes in agricultural practices, declines in abundance are not appreciable in southwestern Ontario, no significant trends have been detected and the species remains abundant in many areas.

Range ON

Status History

The species was considered a single unit and designated Not at Risk in May 2001. Split into two populations in April 2008. The Carolinian population was designated Not at Risk in April 2008.

## **Fishes**

### **Gravel Chub**

*Erimystax x-punctatus*

**Extirpated**

Assessment Criteria not applicable

Reason for Designation

The historic Canadian range of this small minnow was originally a single watershed in southern Ontario. The last record for this species was in 1958 despite extensive, repeated sampling at known sites and other areas of suitable habitat over the last 50 years. Ecosystem restoration of this watershed is underway; however, natural recolonization by the species is not possible because there are no adjacent populations in the Great Lakes watershed.

Range ON

Status History

Last recorded in Thames River drainage, Ontario in 1958. Designated Endangered in April 1985. Status re-examined and designated Extirpated in April 1987. Status re-examined and confirmed in May 2000 and April 2008.

### **Paddlefish**

*Polyodon spathula*

**Extirpated**

Assessment Criteria not applicable

Reason for Designation

This fish, once found in the Great Lakes, was apparently never common in the Canadian portion of its range. It has not been observed in Canadian waters since 1917 despite extensive sampling and the fact that such a distinctive fish would have been easily recognizable.

Range ON

Status History

Disappeared from Canada in approximately 1917. Designated Extirpated in April 1987. Status re-examined and confirmed in May 2000 and April 2008.

### **Western Silvery Minnow**

*Hybognathus argyritis*

**Endangered**

Assessment Criteria B1ab(iii)+2ab(iii)

Reason for Designation

This small minnow species is restricted to the Milk River in Southern Alberta, a region characterized by drought conditions of increasing frequency and severity. While the future of flow regimes associated with the St. Mary's diversion canal and proposed water storage projects are uncertain, consequences of these activities have the potential to significantly affect the survival of the species. Rescue effect from U.S. populations is not possible.

Range AB

Status History

Designated Special Concern in April 1997. Status re-examined and designated Threatened in November 2001. Status re-examined and designated Endangered in April 2008.

### **Bigmouth Buffalo**

*Ictiobus cyprinellus*

**Not at Risk**

**Great Lakes - Upper St. Lawrence populations**

Assessment Criteria not applicable

Reason for Designation

Populations in Ontario appear to be doing well and there are no immediate threats to its continued survival; the area of occupancy appears to have increased and it has been found at 8 new locations since last assessed in 1989.

Range ON



Status History

The species was considered a single unit and designated Special Concern in April 1989. Split into two populations in April 2008 to allow a separate designation of the Bigmouth Buffalo (Great Lakes - Upper St. Lawrence populations). Great Lakes – Upper St. Lawrence populations was designated Not at Risk in April 2008.

**Flathead Catfish***Pylodictis olivaris***Data Deficient**

Assessment Criteria not applicable

Reason for Designation

Since only six adult specimens have been caught in Canadian waters, it is not possible at this time to determine eligibility.

Range ON

Status History

Species considered in April 1993 and placed in the Data Deficient category. Category re-examined and confirmed in April 2008.

**Redbreast Sunfish***Lepomis auritus***Data Deficient**

Assessment Criteria not applicable

Reason for Designation

Insufficient information to determine actual distribution, number of locations, and population sizes and trends.

Range NB

Status History

Designated Special Concern in April 1989. Species considered in April 2008 and placed in the Data Deficient category.

**Arthropods****Rapids Clubtail***Gomphus quadricolor***Endangered**

Assessment Criteria B1ab(iii)+2ab(iii)

Reason for Designation

This distinctive species of dragonfly has a fragmented distribution with a very small extent of occurrence and area of occupancy, and is currently only found in small portions of two southern Ontario rivers. The species is believed to be extirpated at two historic sites and there is evidence for continuing decline of habitat.

Range ON

Status History

Designated Endangered in April 2008.

**Molluscs****Banff Springs Snail***Physella johnsoni***Endangered**

Assessment Criteria B1ac(iv)+2ac(iv)

Reason for Designation

This is a Canadian endemic species with its distribution entirely within the upper reaches of fewer than 5 separate thermal springs locations in Banff National Park, Alberta. These springs comprise a single population, which makes it very susceptible to a catastrophic event. These short-lived animals undergo natural annual fluctuations of over two orders of magnitude. All thermal springs historically or currently occupied by this species have been impacted by human development. These snails are habitat specialists requiring a steady supply of warm thermal spring water containing a high concentration of dissolved minerals and a complex microbial community that provides food and habitat. The species and its habitat are currently protected from disturbance and destruction under *Species at Risk Act* and the *Canada National Parks Act*, but illegal activities such as soaking in thermal waters, which can crush snails and eggs and disturb habitat, are ongoing. The increase in frequency of springs drying due to climate change, which has been observed in the past decade, is believed to be an important threat to this species' survival. However, the species is closely monitored by Parks Canada.

Range ABStatus History

Designated Threatened in April 1997. Status re-examined and designated Endangered in May 2000 and April 2008.

**Fawnsfoot*****Truncilla donaciformis*****Endangered**

Assessment Criteria A2ce; B2ab(i,ii,iii,iv,v)

Reason for Designation

This freshwater mussel is widely distributed in central North America, with the northern portion of its range extending into the Lake Erie, Lake St. Clair and lower Lake Huron drainages of southwestern Ontario. It appears to have always been a rare species in Canada, representing < 5% of the freshwater mussel community in terms of abundance wherever it occurs. Approximately 86% of historical records are in waters that are now infested with zebra mussels and therefore uninhabitable. Zebra mussels, which were accidentally introduced into the Great Lakes, attach to the shells of native freshwater mussels, causing them to suffocate or die from lack of food. The species has declined dramatically and has been lost from four historical locations resulting in a 51% reduction in its range. It is now found in only five widely separated locations, two of which represent single specimens. In two locations, the species' distribution may be limited by the presence of dams that restrict the movements of the freshwater drum, the presumed fish host of the juvenile mussels. Poor water quality resulting from rural and urban influences poses an additional continuing threat.

Range ONStatus History

Designated Endangered in April 2008.

**Hotwater Physa*****Physella wrighti*****Endangered**

Assessment Criteria B1ac(iv)+2ac(iv)

Reason for Designation

This small snail is an endemic species living only within the hotsprings complex located in Liard River Hotsprings Provincial Park in British Columbia. The population is small, numbering fewer than 10,000 individuals and occupies an extremely restricted habitat around the margins of two pools and an outlet stream. Population size is believed to fluctuate by at least an order of magnitude in this short-lived snail (~1 year lifespan). The species is a habitat specialist requiring geothermally regulated water and substrates near the water/air interface in areas of no current. The hotsprings complex has been in use by humans for over 200 years. The species has survived structural modification and maintenance of the pools, the introduction of foreign substances such as soaps and shampoos, and trampling. However, a single event such as abrupt changes in water flow, chemical contamination or introduction of exotic species, could significantly affect persistence of this snail.

Range BCStatus History

Designated Endangered in April 1998. Status re-examined and confirmed in May 2000 and April 2008.

**Vascular Plants****Foothill Sedge*****Carex tumulicola*****Endangered**

Assessment Criteria B1ab(iii)+2ab(iii)

Reason for Designation

This perennial species is known from 10 localized and highly fragmented sites in southwestern British Columbia where it occurs in meadows and shrub thickets within Garry oak ecosystems, a critically imperiled habitat in Canada. The total Canadian population likely consists of fewer than 1000 mature individuals. Factors such as competition and habitat degradation from invasive alien plants, altered fire regimes, urbanization, trampling and mowing place the species at risk.

Range BCStatus History

Designated Endangered in April 2008.

**Fragrant Popcornflower** *Plagiobothrys figuratus* **Endangered**  
Assessment Criteria B1ab(iii)+2ab(iii); C2a(i,ii); D1

Reason for Designation

Although only a single plant was seen in 2005 and none in 2006, the species is likely extant in the form of seeds in the soil. The species' potential for continued survival is at risk from on-going threats to its habitat from such factors as loss of habitat due to urbanization/development, environmental and demographic stochasticity, and competition from native and alien plant species.

Range BC

Status History

Designated Endangered in April 2008.

**Lindley's False Silverpuffs** *Uropappus lindleyi* **Endangered**  
Assessment Criteria B1ab(iii)+2ab(iii)

Reason for Designation

An annual flowering plant of British Columbia restricted to only five extant locations in the Gulf Islands. The species is no longer known to occur on Vancouver Island. There are extremely small numbers of individuals known in Canada. The species is also at continued risk from habitat loss and degradation from such factors as home building and spread of invasive plants.

Range BC

Status History

Designated Endangered in April 2008.

**Muhlenberg's Centaury** *Centaurium muehlenbergii* **Endangered**  
Assessment Criteria B1ab(iii)+2ab(iii)

Reason for Designation

This small annual plant occurs in only three small areas of mainly wet habitat in southwestern British Columbia. Its total Canadian population consists of fewer than 1000 plants. These are highly disjunct from the main range of the species that extends from Oregon to California and Nevada. The species is at continued risk from such factors as the spread of invasive plants and human activities including trampling in areas used for recreational activities.

Range BC

Status History

Designated Endangered in April 2008.

**Rayless Goldfields** *Lasthenia glaberrima* **Endangered**  
Assessment Criteria B1ab(iii,v)+2ab(iii,v); C2a(i,ii); D1

Reason for Designation

A single very small population of an annual flowering plant that is at continued risk from a number of limiting factors including the spread of exotic plants.

Range BC

Status History

Designated Endangered in April 2008.

**Beach Pinweed** *Lechea maritima* **Special Concern**  
Assessment Criteria not applicable

Reason for Designation

The Canadian populations have been recognized as an endemic variety of global significance. Plants are restricted to stabilized sand dunes within localized areas of coastline in New Brunswick and Prince Edward Island. The majority of the 15 populations, including the three largest, occur at elevations under 5 m above sea level. Here they are at increased risk from the impacts of severe storm surges resulting from rising sea levels and increased storm frequency.

and intensity predicted to occur as a consequence of climate change. A recent storm surge has already impacted a substantial portion of potential habitat at one of the New Brunswick sites. Other impacts have also been documented as a consequence of trampling, all terrain vehicle use, and successional changes to the species' habitat.

Range NB PE

Status History

Designated Special Concern in April 2008.

## Lichens

**Seaside Bone**

*Hypogymnia heterophylla*

**Threatened**

Assessment Criteria D2

Reason for Designation

This lichen is endemic to the Pacific Coast of North America, and southwest Vancouver Island represents the northern limit of its range. The species' survival depends on early to intermediate seral shore pine forests along the sea coast. The populations appear to be stable, but have a restricted occurrence and the species is known from only four locations. Severe winter storms, which are anticipated to increase, are the main threat to the species.

Range BC

Status History

Designated Special Concern in April 1996. Status re-examined and designated Threatened in April 2008.

\*The assessments of Yelloweye Rockfish (*Sebastes ruberrimus*), Bigmouth Buffalo, Saskatchewan – Nelson Rivers populations (*Ictiobus cyprinellus*), and Band-tailed Pigeon (*Patagioenas fasciata*) were deferred. These species will be re-considered by COSEWIC in November 2008. The report for Lake Chubsucker (*Erimyzon sucetta*) was withdrawn. Purple Spikerush (*Eleocharis atropurpurea*) designation was deactivated based on a species misidentification. Orangespotted sunfish (*Lepomis humilis*) was determined to be ineligible for assessment.

13/06/2008